A MONOGRAPH OF THE AUSTRALIAN SPONGES.

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PART VI.

THE GENUS EUSPONGIA.

II.—SUB-FAMILIA SPONGINÆ.

Spongidæ of a massive bulbous or irregularly digitate or thick lamellar shape. Vestibule spaces are developed in a few species only, and where they are present they are reciproc to those of the Auleninæ, inasmuch as only inhalent pores are found in their walls, whereas in the Auleninæ, either inhalent and exhalent pores, Oscula are found in them, or there is a tendency towards converting them into Oscula tubes, by the apertures of the exhalent canals becoming more numerous in the walls of these spaces than in other parts of the sponge surface. In those species of Sponginæ, which possess them at all, they are connected with the inhalent canal system only. Such vestibule spaces have been observed in Euspongia canaliculata and irregularis, and also in Hippospongia and some species of Cacospongia.

The skeleton is composed of "main" and "connecting" fibres. The main fibres are disposed in a radial direction and slightly branched in a pencillate manner. They are 2-12 times as thick as the connecting fibres and generally cored with foreign bodies sand-grains, &c. The connecting fibres are always free from foreign bodies with the exception of Euspongia silicata. They are mostly branched. The ramification is regular or irregular in as much as in some species all the connecting fibres are of uniform thickness and form a network with very regular meshes by continually anastomising with one another; or there are radial and tangental connecting fibres distinguished. In that case the tangental fibres are much thicker and extend from one main fibre to the other; the radial ones 2-8 times as the thin and vertical on the former, extend between the adjacent tangental connecting fibres. Both these kinds of ramification of the skeleton fibre are observed in Euspongia species and also in Hippospongia. The connecting fibres in Cacospongia species are not so much branched as in the other two genera so that the meshes of the network, which they form are larger.

Sand and other foreign bodies are often found in abundance in the surface. The sub-dermal cavities are not very highly developed. The pore-sieves in some species contain a great many small pores, in others again only one or two larger ones. In some, narrow canals lead from the pores into the large tangental canals, which form the sub-dermal cavity, whereas in others the pores open direct into them.

Internal canal system and the ciliated chambers do not possess any peculiarities. The chambers measure on an average 0·099—0·013 mm., in diameter.

Sensitive cells occur in various parts of the sponge.

In the family Spongidæ, Schulze (1) acknowledges six genera, namely Euspongia Bronn, Hippospongia Schulze, Phyllospongia Ehlers, Cacospongia Schmidt, Carteriospongia Hyatt and Stelospongia Schmidt. The genera Euspongia, Hippospongia and Cacospongia belong to our sub-family Sponginæ. The other three genera comprise sponges, which belong to the next sub-family namely the Chalinopsinæ.

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(1) *F. E. Schulze.* Ueber den Bau und die Entwickelung der Spongien, VII. te Mittheilung Die Familie der Spongidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXXII., Heft 1.

I have not found it necessary to establish any new genera in this sub-family so that it is constituted of the three genera mentioned above. These are all represented by Australian species, there are no genera known, which have no Australian representatives.

30. GENUS. EUSPONGIA. Bronn (1).

Sponginæ with continuous main fibres. Vestibule spaces are rarely developed and never cause the sponge to attain the appearance of much curved lamella frequently coalescing as in Hippospongia. The meshes of the connecting fibre network are so fine, that they cannot be distinguished with the naked eye. By this our-genus differsfrom Cacospongia. The thickness of the connecting fibres is also less than in the latter species. The average is 0·01 mm.

The diagnosis of the genus is similar to that given by F. E. Schulze. Although Bronn was the first to introduce the name, he meant something different with the word Euspongia than Schulze, according to Bronn, also Hippospongia species would have to be considered as belonging to the genus Euspongia.

A great many of the sponges described by various authors as species of the old genus Spongia belong to our genus Euspongia, as a reference to the synonyms will show. Also the genera Ditela O. Schmidt and Coscinoderma Carter belong to this genus.

Altogether 20 species of sponges can be considered as belonging to this genus. 8 of these are described for the first time in the following pages. 15 species of the 20 are Australian. One of these is cosmopolitan.

I divide the genus Euspongia into 7 sub-genera according to the differences in the mode of ramifying of the connecting fibres. The characteristics of these sub-genera are the following :—

Connecting fibres regularly branched of very varying diameter (Plate 36, fig. 3.) .... 1. *Irregularis*
Connecting fibres differentiated into thick tangental and very thin radial ones (Plate 36, fig. 1.)... 2. *Triplicis.*

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(1) *Bronn.* Die Classen und Ordnungen des Thierreiches. Erste Auflage.

The connecting fibres are differentiated into primary thick long and straight ones, and secundry very short and exceedingly slender ones (Plate 36, fig. 6.) .... 3. *Laxifibris.*

The connecting fibres form a particularly dense network of thick fibres, with narrow meshes, in the skin, in the interior they resemble Triplicis (Plate 36, fig. 5).......... 4. *Ditela.*

Connecting fibres regularly branched of uniform thickness (Plate 36, fig. 2.) .... 5. *Regularis.*

Connecting fibres thick, meshes of network very small (Plate 36, fig. 4.) .... 6. *Densalis.*

Main and also connecting fibres contain in their axes foreign siliceous spicules but no other foreign bodies (Plate 38, fig. 1.) .... 7. *Silicifibris.*

These sub-genera have been established by me more for the sake of convenience than to express real differences in the relationship of different species. If we were to adopt them as such however, we would have to consider their mutual relationship as follows :—

3 Laxifibris, 4 Ditela. 6 Densalis. 7 Silicifibris.

2 Triplicis. 5. Regularis.

1. Irregularis.

I. SUB-GENUS IRREGULARIS.

Euspongia species, the skeleton of which consists of main and connecting fibres. The latter form a regular and fine network. Never more than three fibres join at one point. If these three are of uniform thickness the angles between them are the same.

The distance between two adjacent joining points is also fairly uniform, so that the meshes are all of uniform size and similar in shape, were the fibres are of uniform thickness. But we find that the fibres are very irregular in this respect from the very finest, measuring only 0·001 to such, measuring 0·01 mm.; all gradations are formed, and the angles at the joining points of fibres of unequal thickness are not equal. The fibres are formed in this way, that the thinner one grows out from an already existing thick one. The latter is straight at first, so that then the angles at the sides of the newly formed thin fibre will be 90° each, and the third angle 180.°

As the young fibre grows in thickness it draws the other fibre out of its straight course, so that the angles on the sides of the young fibre increases, whereas the other one decreases. The three fibres issuing from one joining point lie nearly in a plain, so that the sum total of the three angles is nearly 360.° The distances between the joining points of thin fibres are smaller than those between the joining points of thicker ones, and in consequence of this the network becomes irregular. Poléjaeff (1) gives a figure of thicker and thinner connecting fibres in Luffaria. Our sponges have a very different skeleton, inasmuch as there are a great many fibres of intermediate thickness, and not a system of thick and a system of fine ones, as in that Luffaria.

68. SPECIES. EUSPONGIA IRREGULARIS. Nova species.

In this species I distinguish the following four varieties :—

I. Euspongia irregularis silicata.
II. Euspongia irregularis lutea.
III. Euspongia irregularis tenuis.
IV. Euspongia irregularis Jacksonia.

Shape and Size.

The shape of the different varieties and even of different individuals of one and the same variety, vary very much, so that no diagnosis of it can be given.

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(1) *N. Poléjaeff.* The Zoology of the Voyage of H.M.S. Challenger. Part XXXI. Report on the Keratosa, Plate IX., Fig. 5.

The specimens of *Euspongia irregularis silicata* are lobate or massive, but never digitate, sometimes bulbous and spherical. The lobes are slightly flattened and irregular, large and not numerous. This variety is small, the largest lobate specimen measures 120 x 90 mm. The lobes may attain a height of 20 mm., and a similar width, they measure about 8 mm. in thickness.

Occasionally no massive central part at all is developed, and then we meet with different forms. These are lobate, but already approach towards the digitate forms. They are, however, always compressed, so that the lobate character is retained, however much they may resemble digitate forms.

The specimens of *Euspongia irregularis lutea* are massive and irregular without any processes at all. The largest measure to 150 mm. in diameter.

The specimens of *Euspongia irregularis tenuis* possess a very irregular shape with rounded processes. The extensive vestibule spaces render this variety similar to Hippospongia. Some of the specimens of this variety attain a large size, measuring 200 mm. in the largest diameter, generally, however, they are much smaller.

The specimens of *Euspongia irregalaris Jacksonia* are decidedly digitate. These sponges have an irregular shape and attain a size 150 mm. in their greatest diameter. The digitate processes which grow out from the central irregular mass all tend upwards, they are found particularly well developed on the upper side of the sponge. Most of them are cylindrical and rounded at the top. Possessing a circular transverse section these are truly digitate. A few, however, also appear lobate and irregular. They attain a length of 30 mm. and are generally 8 mm. thick. Those which grow out from the side of the sponge are curved, so that their terminal parts are vertical.

Rigidity.

The skeletons are elastic and not very hard. Small specimens, measuring about 50 mm. across are compressed by the weight of 1 kilogramm, about 15 mm. on an average.

Some specimens of *Euspongia irregularis tenuis* are much softer, and one measuring 40 mm. was compressed 50%, that is 20 mm., by the same weight.

This sub-variety might be used for bathing purposes but seems to be rare. I have only seen one single specimen which came from Mauritius.

Euspongia irregularis Jacksonia is the hardest of all..

Colour.

Only the varieties *Euspongia irregularis silicata* and *Jacksonia* have been seen by me in the live state; their colour is light brownish yellow, but varies apparently according to the size or age of the sponges. The largest specimens are very dark in colour, while the small ones are of a light Melange.

In spirits the colour is fairly well preserved but becomes duller and lighter.

Beach-worn skeletons differ very much in colour. Those of *Euspongia irregularis silicata* are dark dirty greyish brown. Those of *Euspongia irregularis lutea* are of a remarkable orange-brown colour, similar to burnt "siena." The skeletons of *Euspongia irregularis tenuis* are very light in colour.

The very soft specimen from Mauritius referred to above is of a pretty light brown colour. Others are nearly white, or very light grey.

The skeleton of *Euspongia irregularis Jacksonia* is dark chestnut brown. It is, according to this possible, to distinguish the varieties of this species from one another by the colour of their beach-worn skeletons.

SURFACE.

The surface of *Euspongia irregularis* specimens of all varieties is the same. It is covered by small conuli, close to one another throughout. Such conuli are also observed in the surface of the vestibule cavities. They are not very regularly disposed, so that the fields between them become slightly irregular. They are on an average 2 mm. apart and 1 mm. high rounded at the top. Often two adjacent conuli coalesce whereby the irregularity in the configuration of the surface is much increased. Sometimes there are zones 3 mm. in breadth without conuli (*Euspongia irregularis Jacksonia,*) running up one side of the digitate processes in a longitudinal direction. These are homologous to the ones more minutely described further on of the species *Euspongia canaliculata ;* they are, however, not met with in the other varieties in so distinct a developement, although also in these indications of aconulose patches are observed.

The oscula are scattered over the outer surface of the sponge in an irregular manner. In those specimens which possess aconulous zones we always find the oscula in these zones. The oscula are are circular and measure from 1-4 mm, in diameter.

Slightly magnified the surface presents the appearance of a very regular network. The meshes of this network measure from 0·1-0·4 mm., in diameter and are always of uniform size throughout the surface.

In *Euspongia irregularis silicata* they are the largest—0·4 mm., and in the variety *Jacksonia* the smallest, measuring 0·1 mm., across. This network is formed by a system of raised lines on the surface, which are about as broad as the depressed meshes between them. In these raised lines an abundance of sand grains and other foreign bodies is generally met with. These give to the whole the appearance of a sand net. This sand net is very regular. Long siliceous spicules are found in it in great masses. These of course are foreign and only collected and not produced by the sponge.

The depressed portions of the surface between this network are the pore sieves. Thin unprotected membranes perforated by the inhalent pores. These pores are very remarkable and different from the inhalent pores, usually observed in horny sponges, in as much as they are very large and few in number. One or two in each field only. They measure 0·03 mm., on an average in diameter and are circular.

The canals leading down from them into the body of the sponge shall be described further on.

This net structure of the surface is developed in a similar manner in the fields between the conuli and on the aconulous portions, as also in the surface of the vestibule spaces.

It is absent only in the surface of the true canals of the sponges and consequently a very useful structure in determining which canals are true canals and which are vestibule spaces.

CANAL SYSTEM.

A. Vestibule Spaces.

As mentioned above, some of the varieties of this species possess very highly developed vestibule cavities, which however are, as pointed out above, by no means homologous to those described in my last paper on Auleninæ. As no oscula are met with in their surface they might be considered as portion of the inhalent system. But the transision forms which connect these vestibule varieties with irregular digitate forms without vestibules are of such a nature as to preclude their acceptance in this sense. Referring to the formation of these Auloplegma structures described in my paper mentioned above I would like to draw the attention of the thinking reader to the different result attained in the two sub-families Sponginæ and Auleninæ by the further developement of this interesting structure.

This can best be explained by the adjoined tabular description :—

(8a.) The apertures in the wall of the sack are closed, and the secundary Pseudogaster hereby becomes a true Oscular tube. At the same time the Pseudosculum is converted into a true Osculum. (*Dendrilla rosea*, *Cacospongia Exemplum terminus.*)

(7a.) This folding results in the formation of an irregular sack, not quite closed, however, with a Pseudosculum. Into this sack, which is a Pseudogaster, only the Oscula open. Whereas the inhalent pores are found in the outer surface only (*Aphrodite Nardorus.*)

(7b.) This folding results in the formation of an irregular system of wide Lacunæ, Pseudogaster, in the surface of which no Oscula, but inhalent Pores exclusively are met (with. (*Euspongia* and *Hippospongia.*)

(6.) This whole structure again folds itself and a secundary Pseudogaster is formed thereby, in the surface of which inhalent pores and Oscula are found (*Aulena*, *Halme* and *Halmopsis.*)

(5.) The chambers become regular in shape and the wall of the sack is folded so as to form an ordinary sponge. The Pseudogaster is converted into an Oscular tube ; the Pseudosculum into a true Osculum (*Leuconidæ*, *Teichonidæ.*)

(4.) A Pseudogaster is formed by the Sponge attaining the shape of a closed sack, in the walls of which the irregular chambers lie. Small pores lead into the chambers from without. Their larger excretary pores, chamber Oscula open into the Pseudogaster (*Leucopsis.*)

(3.) The individuals coalesce to form an irregular mass imbedded in a Mesoderm. Inhalent and exhalent pores leading direct into the chambers are scattered irregularly over the surface. (*Auloplegma.*)

(2.) Sponges which consist of a colony of Olynthis, the individuals of which retain their individuality and Oscula. (*Soleniscus.*)

(1.) The whole sponge consists of one single irregular ciliated chamber, with inhalent pores in its simple wall, and a chamber Osculum, which at the same time is the Osculum of the sponge. (*Olynthus.*)

This tabular view of the developement of the canal system of course does not indicate that the species mentioned as examples are descended from one another. But it shows how the common gastread ancestor developes into the most highly differentiated sponges by a continued process of folding.

The table is the result of the study of the comparative anatomy of the canal system. Transition forms are met with throughout. Of particular interest are those described by me (1) of Cacospongia exemplum which lead from stage 5 to 8a in a peculiar manner and the peculiar structure of Aphrodite Nardorus, described by me in the same paper (2). Some statements regarding the developement of the canal system of Calcareous sponges will be found in Part III., of this Monograph (3).

Of particular interest also is Dendrilla rosea (4) in as much as the oscula tube of this species possesses under its wall, small sub-dermal cavities, similar to those under the outer skin, only smaller.

At the time I drew attention to this extraordinary structure, I do not doubt now, that these sub-dermal cavities are a rudimentary organ indicating that this oscular tube is being formed from an inverted portion of the outer skin. It represents one of the last transision forms between the stages 7a and 8a.

No further developement of the stage 7b has as yet been observed, but it may be assumed that some sponges with a very highly developed inhalent canal system, and particularly those which possess sensitive cells in the diaphrgms which pervade the inhalent canals, have obtained their inhalent canal system by a secundry plication of the ectodermal wall.

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(1) *R. v. Lendenfeld.* A Monograph of the Australian Sponges, Part V. The Auleninæ. Proceedings of the Linnean Society of New South Wales, Vol. X., part 3.

(2) *R. v. Lendenfeld.* L.c.

(3) *R. v. Lendenfeld.* A Monograph of the Australian Sponges, Part III. The Calcispongiæ. Proceedings of the Linnean Society of New South Wales, Vol. IX., p. 1083 ff.

(4) *R. v. Lendenfeld.* Ueber Cœlenteraten der Südsee, II. Mittheilung, Neue Aplysinidæ. Zeitschrift für wissenschaftliche Zoologie, Band XXXVIII., Seite 277.

So long however as no direct proof for this has been brought forward, it will be well to suppose that the inhalent canals have been produced before the sub-dermal cavities and the very constant pore-sieves on the surface ; and that no secundry process of ramification, occurring after the sponges possessed pore-sieves, sub-dermal cavities, &c., has ever lead to the formation of true inhalent canals *below* the skin.

Numerous difficulties present themselves in connection with the formation of the inhalent canals by implication, and here in the sponges with complicated sub-dermal cavities particulaıly Marshall's hypothesis of an entodermal origin of these canals may come near the truth.

While this result of the study of the comparative anatomy of the canal system corroborates the theory established by F. E. Schulze (1) that the sponges are ontogenetically formed by a continued process of folding, to which I referred in my last paper on the Auleninæ (2) ; it shows at the same time that some of the oscular tubes, and very likely all which are very highly developed and large, are formed by an invagination of the outer skin and are accordingly clad with *ectodermal* cells. The limit between ectoderm and entoderm need therefore not necessarily be situated on the margin of the osculum.

Whilst in some Auleninæ, particularly Halme, the sand-armour is developed in the outer skin only, we find here, and also in Euspongia canaliculata no difference in the structure of the skin on the outer surface and in the vestibule spaces of the interior : the formation of these spaces in *Euspongia* and *Hippospongia* is a more recent acquirement.

The development of the vestibule is different in the different varieties of *Euspongia irregularis.* In *Euspongia irregularis silicata* the vestibules form anastomosing and very much curved

(1) *F. E. Schulze.* Untersuchungen über den Bau und die Entwickelung der Spongien IX., Mittheilung, Die Plakiniden. Zeitschrift für wissenschaftliche Zoologie. Band XXXIV., Seite 438.

(2) *R. von Lendenfeld.* A Monopraph of the Australian Sponges, Part V., The Auleninæ. Proceedings of the Linnean Society of New South Wales. Vol. X., part 3.

canals with a circular or oval transverse section and an average width of 3 mm. These join to form a pseudogaster which opens by a slightly raised pseudosculum in some specimens. In others no true pseudosculum has been observed, but generally such are well defined. They are from three to ten in number. We will find them much higher developed and most remarkable in *Euspongia canaliculata.* *Euspongia irregularis lutea* possesses no vestibule space.

In *Euspongia irregularis tenuis* on the other hand it is very highly developed, and formed of similar anastomosing canals as in the variety *silicata.* No pseudoscula have been observed in the specimens of this variety, as the vestibule canals open irregularly and indiscriminately over the whole surface.

Euspongia irregularis Jacksonia is similar, as far as the developement of the vestibule spaces is concerned, to the variety *tenuis.*

B. True Canals.

The canal system of all the varieties is the same. In fact if I found two similar sponges with any difference in their canal system I would consider them as two distinct species.

In each pore-sieve there are one or two large inhalent circular or oval pores measuring on an average 0·03 mm. in diameter. Of course their size greatly depends on circumstances. I have never observed them to be entirely closed, but I believe that the strong muscular cells which are disposed in rings around them, so as to form true sphincters, can contract them to a quarter of their width when dilated. The largest I have seen measured 0·05 mm., the smallest 0·012 mm. across.

From these pores narrow canals lead down in an oblique direction through the thick skin. These canals average a width of 0·04 mm., which measurement corresponds with the measurement of the dilated pores as seen from the surface very well. The skin is on an average 0·06 mm. thick and below it the sub-dermal cavities extend. These cavities are formed by tangentally extended canals of a circular transverse section, which form frequent anastomoses and undermine the skin throughout the entire surface.

These canals vary very much in size. The measure from 0·25-1 mm. in diameter. In the digitate and lobate processes they extend mainly in a longitudinal direction. Very few and scattered larger inhalent canals extend from these downward into the interior of the sponge.

They ramify very much, and so, a great many cylindrical canals are produced, which extend mainly in a longitudinal direction. They measure 0·05 mm. in diameter, and are surrounded by ciliated chambers of the ordinary shape and size. The latter open into wider exhalent, likewise longitudinally disposed, and circular canals which measure on an average 0·2 mm. in diameter and coalesce to form irregularly disposed canals which lead, extending in a tangental direction, towards the extensive lacunes of the exhalent system.

I have mentioned above that the oscula are usually surrounded by acanulous zones, and we find that these zones are destitute of a skeleton and are represented in dry skeletons by irregular grooves and depressions. We find these askeletous parts, which are more highly developed in *Euspongia canaliculata*, and which will be minutely described under that heading, filled with a very lacunose tissue with fewer chambers, and much larger exhalent canals than in the askeletous parts of the sponge. These large exhalent canals join to form a very short oscular tube. Often no oscular tube at all is developed, and the membranes which divide the lacunæ reach nearly up to the osculum itself.

Skeleton. (Plate XXXVI., fig. 3.)

The differences of the four varieties are mainly found in differences of the skeleton.

The skeleton of all the specimens agree in the following points:—

The main fibres are cored with foreign bodies, and on an average 1 mm., apart. They are not much curved and extend radially from the base of the sponge upward and outward and are mostly branched in a penicillate manner.

The connecting fibres form a very regular network, where they are of uniform thickness, but the otherwise regular meshes become irregular when the thickness of the connecting fibres varies; in the manner described above in the diagnosis of the sub-genus Irregularis.

The network is more dense in the vicinity of the main fibres than in the other parts.

The connecting fibres are always free from foreign bodies.

I. Euspongia irregularis lutea.

The main fibres are completely filled with foreign bodies About 70% sand grains and 30% broken foreign siliceous spicules.

Their surface is rendered very uneven as the depressions between the projecting parts of sand grains and spicules are not entirely filled up with horny substance.

The diameter of the main fibres is 0·05 mm. The knobs on the surface may increase the thickness locally to 0·09 mm. The sand grains measure on an average 0·02 mm.; and the siliceous spicules attain occasionally a length of 0·1 mm.

The meshes of the connecting fibres have an average width of 0·08 mm., near the main fibre and 0·2 mm., in the portions of the skeleton which are more distant from them. The connecting fibres are thicker in the vicinity of the main fibres.

50% of the fibres are thick, with an average diameter of 0·02 mm.

40% of the fibres measure 0·01—0·017 mm.

Thinner fibres are rare, the finest measure 0·005 mm.

II. Euspongia irregularis silicata.

The main fibres contain a number of foreign bodies in their axial portion. These are mainly siliceous spicules of other sponges. Forming 90% of the foreign bodies. The other 10% are chiefly foraminifera shells, &c., there is hardly any sand.

As the foreign bodies are only found in the centre, the surface of the main fibre is smooth.

The main fibres are generally circular in transverse section, but occasionally they are flattened to form a perforated horny plate. No foreign bodies are found in those portions of the main fibres which are converted into perforated plates.

The thickness of the main fibre is 0·1 mm.

The foreign siliceous spicules occasionally attain a length 0·14 mm

The meshes of the connecting fibres are of the same size near the main fibres as in the intermediate parts of the sponge ; occasionally very regular and measuring 0·23 mm.

The greater number, 70% of the connecting fibres are of great and uniform thickness, measuring 0·04 mm. in diameter.

There are places in the sponge where all the fibres are thick whereas in others the thinner ones prevail. These measure 0·014 in thickness, and where they prevail the net work is much more irregular.

III. Euspongia irregularis tenuis.

The main fibres of this variety are filled with dense masses of very fine grained sand. Two or more main fibres often extend for some distance parallel and close together.

Their surface is rough.

They measure 0·06 mm., in thickness. The knobs are small and close together. The foreign bodies in the main fibres are sand. No foreign spicules have been observed in the main fibres of this variety. The average size of the sand grains is 0·012 mm.

The main fibres, where they extend in close proximity, are joined to each other by bridges of horn-substance, which often are of great thickness and always free from foreign bodies.

The connecting fibres form a network which indicates an approach to the differentiation of tangental primary and radial secundry connecting fibres as it is expressed in the sub-genus Triplicis. This approach however is very slight. Occasionally little patches of a very dense net work are observed in the proximity of the main fibres. The meshes in these are very irregular and average a diameter of 0·02 mm.

The ordinary meshes are likewise very irregular in shape and size, and more regular where the main fibres are far apart, than where they are close together. Their size varies 0·1 to 0·22 mm.

The connecting fibres are remarkable for their small diameter. The thickest, which form about 50% of the whole measure 0·024 mm., whilst 40% are formed of fibres averaging 0·01 mm. in thickness. The remainder are still more slender fibres, the thinnest observed by me in this variety measured 0·004 mm.

IV. Euspongia irregularis Jacksonia.

The main fibres are cored with a dense mass of large sand grains. These, however, are only found in the central part of the fibre, so that its surface is perfectly smooth.

The main fibre has a thickness of 0·1 mm.

The sand-grains measure on an average 0·05 mm. All the sand-grains seem to be of uniform shape, and also very similar in size. They are all more or less spherical.

The connecting fibres express the peculiar irregularity of the fibres in this sub-genus, in the most striking manner.

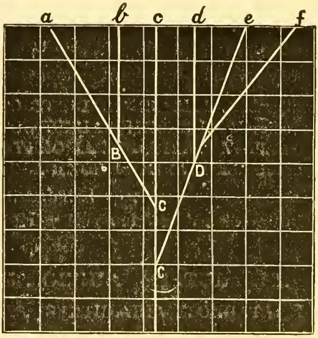
It is difficult to give measurements. The meshes are of similar shape and size in all parts of the sponge. Square ones predominate.

They measure from 0·07 to 0·17 mm. The size of the meshes is in proportion to the size of the fibres.

The fibres vary very much in thickness.

20% of the fibres are very thick, 0·04 mm. in diameter. Fibres with a thickness of 0·01 mm. form about 30% of the skeleton; whereas the remaining 50% is formed of fibres which measure only from 0·003—0·008 mm. in thickness.

The mutual relationship of these varieties to each other, and to the other sub-genera is shown in the following table. If we assume, as is usual in such cases that the connecting links, the intermediate varieties are unchanged descendants of certain stages of a changing series of generations which finally formed the most differentiated species, we will have to consider the table as a true ancestral tree. For example :—



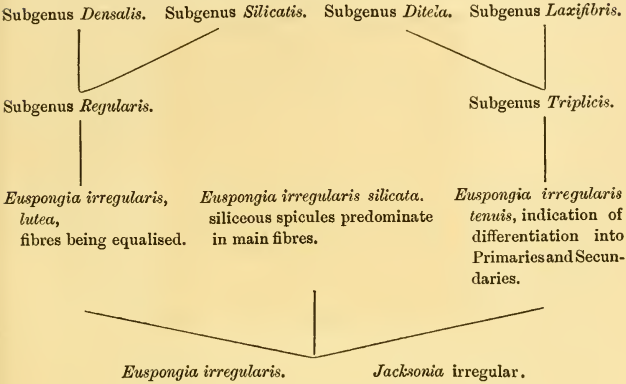
If b are unchanged descendants of B, and B is one of the real ancestors of the species a being formed, b can be considered as an ancestor.

In the same manner d is the unchanged descendant of D. D a real ancestor of e and f, and therefore d can be considered as a representative of the real ancestor.

I insert this self-evident explanation here to avoid the possibility of my ancestral tables being misunderstood.

Histology.

A muscular membrane extending in a tangental direction below the sub-dermal cavities has been observed in this species. This membrane is throughout parallel to the outer surface, and composed of the ordinary spindle-shaped muscular cells which form several layers in it. At the conuli it rises up to the surface, and there it joins the muscular system of the outer skin. This skin is perforated by the canals which lead from the sub-dermal cavities into the interior of the sponge, but otherwise it appears quite continous. There can be no doubt, that by contractions of this membrane the width of the sub-dermal cavity can be decreased, and by local contractions the water current regulated.



Geographical Distribution.

I. Euspongia irregularis silicata.

South Coast of Australia, St. Vincent Gulf (Haacke); East Coast of Australia, Port Jackson (Von Lendenfeld); Fiji (Ramsay); Chatham Islands (Parker).

II. Euspongia irregularis lutea.

Mauritius (Von Haast).

III. Euspongia irregularis tenuis.

North Coast of Australia, Torres Straits (Haacke); East Coast of Australia, Long Reef (Ramsay); Chatham Islands (Parker); Mauritius (Von Haast).

IV. Euspongia irregularis Jacksonia.

East of Coast of Australia, Port Jackson (Ramsay, von Lendenfeld).

Bathymetrical Distribution.

I. Euspongia Irregularis silicata.

10 metres (Port Jackson); Shallow water (Chatham Island, Fiji and St. Vincent Gulf).

II. Euspongia irregularis lutea.

Shallow water.

III. Euspongia irregularis tenuis.

Shallow water.

IV. Euspongia irregularis Jacksonia.

10-20 metres.

69. SPECIES. EUSPONGIA CONIFERA. Nova species.

Shape and Size.

This species presents the appearance of half a sphere. The lower side with which the sponge is attached is perfectly flat and has a very regular circular contur. The upper side is convex and bears numerous high cones, on the summit of each of which there is a circular osculum. The only specimen measures 180 mm. in breadth and 80 mm. in height. The cones on the upper side all stand vertical and are of the same shape, although different in size. The largest are 25 mm. high and 30 mm. wide at the base, the terminal oscula are circular and measure from 6-10 mm. in diameter.

The shape of this sponge is a most exceptionally regular one.

Skeleton.

The main fibres radiate from the centre of the circular lower side laterally and vertically. They are slightly curved in a very regular undulating manner. Each undulation measures about 12 mm. in length and 5 mm. in depth. The main fibres are branched in a penicillate manner, and on an average 0·6 mm. apart from each other. They are 0·07 mm. thick, and filled throughout with small sand-grains. Their surface accordingly is roughened. The knobs are comparatively high but not very broad, and very close together.

There are no foreign bodies in the connecting fibres. The meshes of their network measure from 0·1 mm. to 0·3 mm. They are not regular. Extraordinary to say the meshes in the vicinity of the main fibres are larger than those further away from them. Where the main fibres are very close to each other the connecting fibres sometimes are simple, not branched and stand vertical on the main fibres which they connect. The thickness of the connecting fibres varies from 0·01 mm. to 0·04 mm.

The only specimen of this sponge is a dry skeleton, so that its position must be somewhat doubtful. No description of the surface, colour, canal system and histology can therefore be given.

The colour of the skeleton is a pretty light brown.

Geographical Distribution.

North Coast of Australia, Torres' Straits (Macleay).

Bathymetrical Distribution.

Probably shallow water.

II. Sub-Genus. Triplices.

The connecting fibres in the species referred to this sub-genus are differentiated into thicker tangental and finer radial ones. The former connect the radial main fibres, and are not at all or only very slightly branched, either straight or curved, in such a manner that the concave side looks towards the surface and the convex side towards the interior. These primary connecting fibres are joined to each other by secundary radial fibres which are much thinner, straight and short, in some species the primary fibres are not quite straight, but slightly bent at the joining points of the radial secundaries.

SPECIES. EUSPONGIA CANALICULATA. Von Lendenfeld.

EUSPONGIA ANFRACTUOSA. Carter (1).

I distinguish three varieties of this species, namely :—

I. *Euspongia canaliculata dura,*

II. *Euspongia canaliculata elastica* and

III. *Euspongia canaliculata mollissima.*

Carter's *Euspongia anfractuosa* mentioned above is identical with my variety *E. c. dura.*

Shape and Size.

Euspongia canaliculata resembles in appearance certain forms of *Euspongia zimocca* F. E. Schulze (2) pretty closely. It is irregular, massive, spherical, attached by a small, slightly protruding portion of the broad base and bears on its upper side numerous short digitate processes, which are hollow.

These are about as long as broad and rounded on the summit. They measure 10-20 mm., both ways.

The size of the whole sponge is the same in the three varieties, the largest specimens measure 150 mm., in breadth and 100 mm., in height.

The skeleton in particular, and to a certain extent also the dry specimens show deep, and irregular more or less longitudinally disposed grooves in the surface, which occasionally reach down to

(1) *H. J. Carter.* Description of Sponges from Port Phillip Heads, South Australia, continued. Annals and Magazine of Natural History. Series 5, Vol. XV., p. 316.

(2) *F. E. Schulze.* Untersuchungen über den Bau und die Entwickelung der Spongien, VII., Mittheilung ; Die Familie der Spongidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXXII., Seite 615.

the central cavity. The developement of these grooves or canals and of the finger shaped processes is different in the different varieties, and by these external differences the varieties can be readily distinguished.

In *Euspongia canaliculata dura*, the digitate processes are most regular, dome-shaped and large, measuring 20 mm., in diameter, whilst the grooves are very narrow and not very numerous.

The skeleton of this variety consequently possesses a comparatively smooth appearance.

In *Euspongia canaliculata elastica* the digitate processes are longer but more slender, measuring 12 mm., on an average in diameter and 18 mm., in height. The skeleton of this variety presents a much more irregular aspect because the grooves are so numerous and broad that the sides of the digitate processes appear entirely cut up by them into isolated erect portions.

In *Euspongia canaliculata mollissima* the digitate processes are much smaller than in either of the foregoing varieties and not so numerous. They do not take up the whole of the upper surface of the sponge.

The whole of the surface is covered by a network of meandric grooves, which are of similar dimensions as in *Euspongia canaliculata dura*. These grooves form anastomoses and in this way cut the whole of the surface up into numerous irregularly shaped fields. This of course only applies to the skeleton.

Colour.

The colour of the live sponge is brownish grey. It spirits it becomes lighter. Beach worn skeletons of *Euspongia canaliculata dura* are of a dirty greyish-yellow colour. Those of the other two varieties are reddish brown the colour of "burnt siena."

Rigidity.

The skeletons of all the three varieties are very elastic, but at the same time much harder than any variety of *Euspongia officinalis* known to me. In consequence of this rigidity, *Euspongia canaliculata* cannot be used for similar purposes as the bathing sponge.

As the variety-name implies *Euspongia canaliculata dura* is the hardest. 1 kilogramm weight compresses a large specimen only about 3 mm. *Euspongia canaliculata elastica* is very much softer. 1 kilogramm compresses it about 8 mm. *Euspongia canaliculata mollissima* is a little less elastic than the two other species and about as hard as *Euspongia canaliculata elastica.*

Surface.

The surface is the same in the three varieties. There are no conuli, and it therefore appears very smooth. In this respect our species differs widely from *Euspongia officinalis* and many other species. With a magnifying glass one perceives that the surface is covered by a very regular network of a uniform appearance throughout. There is no difference whatever in the surface of the extensive vestibule spaces and the external surface. This network is similar to the one described above of *Euspongia irregularis.* It is produced by a network of raised lines on the surface. The meshes are 0·16 mm. wide, and the lines of the network itself 0·08 mm. broad.

The protruding net is filled with sand-grains, there are however, no siliceous spicules as in *Euspongia irregularis.* The sand-grains measure from 0·15 to 0·28 mm. In the meshes of this network the pore-sieves are situated, which possess a great many small pores from 8-20 in number.

These pores are the commencement of the inhalent canals.

Corresponding to the grooves in the skeleton described above, there are askeletous portions of the sponge. These are accordingly disposed mostly in longitudinal lines. On their surface, which is not different from the surface of other parts, except that it sometimes appears more or less retracted or collapsed, the small circular Oscula are found which measure 1-2 mm. in diameter. The Oscula are disposed in lines, and on an average 10-15 mm. apart.

CANAL SYSTEM.

A. Vestibule spaces.

On the summits of the digitate processes round holes are found, which resemble Oscula very closely These are however the apertures of the system of Lacunæ, which must be considered as a vestibule space, and have nothing to do with the exhalent system. The vestibule cavity consists of wide canals with circular transverse section, measuring from 5 to 12 mm. in diameter. These canals are mostly upright, vertical and form here and there anastomoses, about $\frac{1}{2}$ to $\frac{2}{3}$ of the volume of the sponge is taken up by these vestibule spaces.

They are connected with the outer world only by the Pseudoscula on the summits of the processes. There are no other apertures, so that the whole space appears as a perfectly closed Pseudogaster. No Oscula open into these spaces, their walls are pervaded only by the inhalent pores, and so these cavities appear as an outward appendage to the inhalent system ; they are perfectly homologous to the vestibule spaces described above of *Euspongia irregularis.*

B. True Canals.

The canal system of our sponge is very remarkable. The pore sieves are pervaded, as mentioned above by a great number of very small pores. These are circular and can be entirely closed at the option of the sponge. In consequence of this, the number in each pore sieve found open and visible is very variable. The greatest number counted by me in one pore sieve was 20. They are circular and scattered regularly over the whole of pore-sieve. They measure when dilated 0·01 mm. in diameter. The pore-sieve itself is a very fine skin 0·01 mm. thick and attached to the sand-net which divides the pore sieves from each other.

These structures are perfectly similar in the outer, and inner side of the lamellous body of the sponge. The pores of the inner surface open into the vestibule, those of the outer surface into the outer world. Below the pore-sieves extensive sub-dermal cavities are met with. (Plate 37, fig. 1.) These are larger below the inner surface than below the outer surface. The sub-dermal cavities below the inner vestibule surface are irregular, tangental, and mostly longitudinal canals of an irregularly oval transverse section.

Their largest diameter may attain 3 mm. Such immense sub-dermal cavities are rare.

The sub-dermal cavities below the outer surface are similar, irregularly longitudinal canals, which, however, are very much narrower. These are also much more flattened tangentally and attain a width of 1 mm. and height of 0·5 mm.

From these extensive cavities canals extend down towards the interior of the sponge, which have an average diameter of 0·1 mm., a circular or oval transverse section, and which extend likewise in a more or less longitudinal direction. They ramify continually, and the smallest final ramifications which have the same shape as the larger canals, measure 0·02 mm. in diameter. (Plate 37, fig. 1). The ciliated chambers form $\frac{3}{4}$ of spheres and measure 0·032 mm. in diameter. The exhalent canals are similar in shape, size and direction to the inhalent ones, and join to form larger stems, which no longer extend longitudinally but curve towards the askeletous portions of the sponge attaining a more and more transverse direction the larger they become. The askeletous portions of the sponge. (Plate 37, fig. 1), are very much less dense than other parts and consist mostly of wide Lacunæ, separated from each other by tender membranes as in *Euspongia irregularis.* These Lacunæ join and finally open into the short and wide oscular tube. They average a diameter of 0·6 mm., the membranes which divide them from each other are only 0·005 mm. thick in certain places. In portions also of the askeletous part ciliated chambers are found (Plate 37, fig. 1), particularly in the depth; no chambers open directly into the large oscular tube which measures 1-2 mm. in diameter.

Often the skeleton is interrupted throughout the entire width of the sponge lamella between the vestibule space and the outer surface. In such cases the lacunose tissue formed by the congregation of the exhalent canals extends also down to the vestibule space.

No oscula are found either in the skeletous part or in the walls of the vestibule cavity.

Skeleton.

(Plate 36, fig. 1.)

The main fibres of the skeleton radiate from the point of attachment outward and upward. They extend mainly in a longitudinal direction and branch in a more or less penicillate manner. The main fibres are joined on the surface to the sand-armour, and it is clearly visible that their sand-core is a direct continuation of the sand in the skin.

The main fibres curve gracefully outward in their distal portions and all their ends are joined to the *outer* skin. Never is a free termination of a main fibre formed in the interior. This shows that these main fibres grow in the same manner, as the main fibres of Halme, namely just below the outer skin.

It is also very remarkable that no main fibres are joined to the inner skin on the vestibule side of the lamella.

The consequence of this is that the skin can be drawn off on the inner side, whereas it appears firmly attached on the outer.

In detail the main fibres, although always completely filled with foreign bodies differ in the different varieties, and these details shall be described below.

The connecting fibres form, as mentioned above in the diagnosis of the sub-genus, two systems. Thicker primary tangental, and thinner secundary radial connecting fibres are distinguishable. The mode of ramification varies in the varieties, and shall be described below. The connecting fibres never contain foreign bodies.

It is most remarkable that round the grooves in the skeleton filled by the lacunose, askeletous tissue, the connecting fibres terminate with sharp points. (Plate 37, fig. 1, b.) This is evidently a defensive arrangement against foreign intruders which might attempt to get into the body of the sponge from the wide exhalent lacunose or from the oscular tube.

I.—EUSPONGIA CANALICULATA DURA (Plate 36, fig. 1.)

The main fibres are slightly and gracefully curved, on an average 1·3 mm. apart they taper towards the distal end which supports the dermal armour of sand. They measure 0·1 mm. in thickness and have a smooth surface. They are entirely filled with foreign bodies, which are small sand grains measuring for the most part 0·025 mm. with a few short fragments of foreign spicules.

The connecting fibres are differentiated into primary tangental and secondary radial ones very much more clearly than in the other varieties. The former are on an average 0·3 mm. apart. The primary connecting fibres are either straight or gracefully curved, appearing like ropes supported by the upright main fibres and slightly depressed in the centre. They do not show the slightest trace of curvatures or angles at the joining points. Rarely they devide into two roots in the vicinity of the main fibres. Generally they are perfectly simple throughout, and do not ramify at all. At the base they extend in a trumpet-shaped manner to join the main fibre. They measure 0·03 mm. in thickness on an average. The thickness, however, seems to be in correlation with the length, in as much as the longer fibres are always thicker than the shorter ones.

The secondary connecting fibres are not regular but still more so than in the other varieties. Many of these fibres are quite simple, and extend in a more or less radial direction, connecting the primary fibres with each other. They generally do not stand vertical on the primaries, but are more or less oblique. Many appear ramified and altogether they form an irregular network of fibres of varying thickness which connects the primaries.

Their thickness varies from 0·01 to 002 mm. They are attached to the primaries by a broad trumpet-shaped extended basis.

II. EUSPONGIA CANALICULATA ELASTICA.

The main fibres are slightly and gracefully curved and taper more abruptly toward the end, than in the foregoing variety. The main fibres have a smooth surface and measure 0·1 mm. in diameter, they are a little closer together than in the foregoing variety. They contain axial foreign bodies, which, however, are not near so numerous as in *Euspongia canaliculata dura.* These foreign body are mostly sand-grains, measuring on an average 0·02 mm. The connecting fibres are differentiated into primaries and secundaries not so distinctly, however, as in the variety described above. Particularly we find not so great a difference in thickness.

The primaries are on an average 0·4 mm. apart and form angles at the joining points of the secundaries. They, therefore, do not appear like graceful curves pendant between adjacent main fibres, but rather as broken lines, composed of longer or shorter straight portions which are joined at angles approaching 180° very closely. They measure 0·028 mm. in thickness. Also here we find those which extend between distant main fibres thicker than those which join two more adjacent main fibres.

The secundaries are rarely simple, mostly they ramify and anastamose so as to form a regular network, the meshes of which measure 0·3 mm. on an average.

The thickness of the secundaries varies from 0·005 to 0·025 mm. The very thin ones are rare. The intermediate ones predominate.

As the primaries are bent at the joining points and the secundaries approach the thickness of the primaries the differentiation between primaries and secundaries becomes indistinct.

Particularly this becomes apparent between main fibres, which lie close to each other where the network is similar to that of the subgenus Irregularis, whereas between the more distant main fibres the differentiation is clearly visible.

III. EUSPONGIA CANALICULATA MOLLISSIMA.

The main fibres of this variety are very different from those of the other varieties. They are on an average 0·9 mm. apart and 0 14 mm. thick. The surface is roughened by a few small knobs. These fibres are never straight or gracefully curved, but appear irregularly bent and twisted a peculiarity which characterises the variety. They contain foreign bodies in great abundance. These are very small sand-grains, measuring only 0·014 mm.

The differentiation between primary and secundary connecting fibres is still less clearly expressed, than in the foregoing variety, although, also in this one, the two can be distinguished at least in certain parts of the skeleton. The primaries are formed of straight portions which join at angles, not so near 180° as in the foregoing variety. Occasionally the portions between the joining points are slightly curved. These fibres are 0·4 mm. apart and on an average 0·032 mm. thick. Their thickness is, however, subject to unusual variations and not proportionate to the length of the fibres as in the other varieties. The secundaries form a very irregular network, and there are no simple unbranched ones at all. The meshes average a diameter of 0·2 mm. The fibres vary very much in thickness from 0·008 to 0·03 mm. Some of them are as thick as the primaries.

It will appear from this that there is a gradation in the development of the "triplicis" mode of ramification represented by these varieties. That the specimens, which are considered by me as varieties of this species really are very nearly related, can hardly be doubted when it is considered that their anatomy and even shape is so very similar. This shows then that the mode of ramification of the connecting fibres is not a thing of much systematic value, as has been asserted by Bowerbank and others, and that here again, as in so many other cases the idea of constancy in a certain organ has been broken down by more extensive researches.

The varieties *Euspongia canaliculata mollissima* and *elastica* connect the variety *dura* closely with *Euspongia irregularis.* A further developement in the direction indicated has been attained by *Euspongia Matthewsi*, the representative of the following subgenus. The developement of this kind of ramification of connecting fibre is already indicated in the variety *tenuis* of *Euspongia irregularis*.

It can be made clear by a perusal of the following table wherein unchanged descendants of the true ancestors are enumerated in a series which probably represents the true ancestral descent very closely :—

Subgenus Laxifibris   Subgenus Ditela.

Euspongia canaliculata dura.
Primaries straight.

Euspongia canaliculata elastica.
Primaries slightly bent.

Euspongia canaliculata mollissima.
Primaries much bent.

Euspongia irregularis tenuis, indication of differentiation into Primaries and Secundaries.

This table also shows the mutual relationship of the different varieties.

Histology.

The remarkable structure of this sponge led me to investigate its histology more closely and I have arrived at some interesting results differing to a great extent from the histology of other sponges as described by F. E. Schulze, Vosmaer, Poléjaeff, and myself.

Skeleton.

The fibres are highly colorable, more so than those of other Spongidæ. The connecting fibres consist of perfectly clear and transparent Spongiolin and do not show a trace of being composed of concentric layers.

There is of course no doubt whatever, that they have been formed like those of other horny sponges, but it is remarkable that all the layers have precisely the same refractive power.

Only the outermost layer, the youngest, appears slightly different under a high power in as much, as it absorbs coloring matter less than the others and also refracts the light not so much as the central parts. This is visible in a very striking manner in fine sections. It must be assumed, that the outermost layer, which consists of newly formed spongiolin is less dense than the older spongiolin in the centre and probably there is a certain amount of water in it, which is absent in the older central portions. I have some time ago (1) expressed my opinion that the newly formed Spongiolin is slimy. The structure of the fibres of our sponge are of such a nature as to corroborate this. The Spongiolin is a *hardened slime*, and it hardens by a process of drying, that is losing the water with which it was originally mixed.

This slime is poured over the fibres or foreign bodies by the spongoblasts and there it hardens to spongiolin.

The outer horny layers which enclose the foreign bodies in the core of the main fibres, however, are clearly stratified. This difference would point to a difference in the formation of these two. It appears that the connecting fibres are produced in a short time and do not grow in thickness after they have once been formed, whereas the main fibres occasionally receive a fresh coating of spongiolin so as to strengthen them.

No increase in strength in the connecting fibres is required as the sponge grows in size, but the strain on the main fibres is of

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(1) *R. v. Lendenfeld.* Ueber Cœlenteraten der Südsee II., Mittheilung, Neue Aplysinidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXXVII., Seite 269.

course increased, so that it also appears advantageous that the thickness and strength of the main fibres should be increased. The spongiolin produced at one and the same time will be of the same nature, so that the layers formed by it are not rendered visible. For this reason the rapidly formed connecting fibres do not show any stratification.

The spongiolin produced at different times is slightly different so that successive layers of spongiolin formed at greater intervals of time will show their limits. This is the case in the main fibres.

The axial thread is very well developed in the connecting fibre and clearly visible, it consists of a granular mass and has a thickness of 0·0004 mm. The connecting fibres join generally in such a way that three fibres radiate out from one point. On close examination it appears that two of these are portions of one and the same continuous fibre with a continuous axial thread, whereas the other grows out from it at the side. The axial thread of the latter is not connected with the continuous axial thread of the former. It terminates moreover with a trumpet shaped extension on the surface of the other fibre. In the same way also the axial threads terminate, where the connecting fibres join the main fibre. This shows clearly that the three fibres radiating from one joining point never are equivalent, but that the one is a primary fibre to the side of which the other has attached itself afterwards and therefore appears as a secundary. Light is thrown by this peculiarity on the growth of the connective fibres.

In the description of the skeleton I have mentioned that the connecting fibres terminate at the sides of the grooves in the skeleton with sharp points. It is always the primaries which terminate in this remarkable manner (Plate 37, fig. 1, b.) The points are very sharp and abrupt so that the contour is somewhat similar to a Roman short sword's point. The axial thread terminates a little behind the point.

The points stand very close together and the whole is a most effective defensive arrangement. I am not aware that such free and pointed terminations have been observed in other horny sponge.

MUSCULAR LAMELLÆ.

The skeletous part of the sponge is divided from the askeletous portion by a membrane, which extends down from the outer surface to the bottom of the groove. This membrane is situated just in front of the points of the connecting fibres (Plate 37, fig. 1) and surrounds the part of the sponge occupied by the large lacunæ of the exhalent canals. This membrane consists of radially disposed parallel, elongate, spindle shaped cells. These measure 0·032 in length and 0·0015 mm., in thickness, in the centre. The ends of these cells are very slender forming extremely find threads. In the middle of the length but not in the axis of the cell the nucleus is situated, it lies near the side and is very elongate, oval situated longitudinally. It measures 0·0034 mm., in length and 0·0011 mm., in width. The cell is entirely filled by a very granular and highly colorable protoplasm. The granules are remarkable for their large size, which may be estimated at 0·00025 mm. The ground substance in which these granules are imbedded does not refract the light very much, the granules however are highly refracting. The ground substance refracts the light *simply*, whilst the granules show when examined with the polariser that they *refract the light doubly* in a similar manner as the discs in the straited muscles of higher animals. These granules are scattered throughout the cell in an irregular manner, but still one notices that they appear to have a tendency to group themselves in transverse rows or discs. In this way the cells of the muscular membrane of our sponge appear as an interesting transition form from the simple undifferentiated contractile elements of sponges to the striated muscular cells of higher Cœlenterates. It will be known to the reader that striated muscular elements, which are so widely distributed in the latter and have even been found in Hydroid Polyps (1), do not occur in sponges. The cells in this organ of our sponge are the nearest

(1) *R. v. Lendenfeld.* Muscular Tissues in Hydroid Polyps. Proceedings of the Linnean Society of New South Wales. Vol. IX., Pt. 3, p. 635.

approach to them. I have been informed by Mr. Haswell, that he has discovered a similar transition form in certain radiating muscular cells round the stomach of a worm.

That the membranes in question really are muscular is rendered particularly evident by the great differences in the degree of depression of the skin which covers the lacunose askeletous parts of the sponge, which are an indication of extensive movements. The latter can only be caused by contractions of this membrane.

This membrane is perforated at the base by the exhalent canals, which lead from the skeletous portion of the sponge into the askeletous part, taken up by the lacunæ of the exhalent system.

Nervous System.

At its distal margin the muscular membrane described above is thickened. (Plates 37, fig. 1, i.)

In transverse sections through this distal thickening we find that no spindle-shaped granular cells take part in its formation but that it is composed of a highly colourable granular mass in which large nuclei are contained. The latter are spherical and measure 0·002 mm. in diameter. From the sides of this structure granular threads extend in a tangental direction and from its distal surface slender, straight, or curved spindle-shaped cells arise. The distal part of these reaches the outer surface. The cells are curved in such a manner that this part is always nearly vertical to the surface. To attain a vertical position of the end it becomes necessary for those spindle-shaped cells, which originate at the side of the swelling, to curve.

These cells measure 0·02 mm. in length. At the ends they are 0·0005 mm. thick, but in the thickest central part they measure 0·00015 mm. across. They are filled with granular protoplasm, which imbibes staining fluids very readily and is turned brown by the action of osmic acid. In it we find, in the central swelling, an oval nucleus 0·002 mm. long and 0·0006 mm. broad, and a few large and remarkable granules which appear particularly after osmic acid treatment as very distinct black spots.

I am of opinion that this structure must be considered as an organ of sense comparable to the ring nerve of craspedote Medusæ or the sensitive and ganglia cells, which form a circular zone in the entoderm of the manubrium of certain hydroid polyps.

The membrane surrounds, as mentioned above the lacunose portion, and it is crowned by this nervous structure, which accordingly appears as a sensitive zone round the askeletous area. The distal swelling of the membrane consists of ganglia cells, the nuclei of which are apparent, the limits of which however are indistinct, there is only a slight indication of the formation of limits.

The spindle-shaped cells in the skin should be considered as sensitive elements and their basal processes as nerves, which lead from the sensitive cells to the ganglia cells. These processes are short in the cells just above the ganglia cells and longer as the cells are further removed. The tangental granular threads represent tangental nerves which lead from the ring nerve to other parts of the surface.

This nervous system, as also that in other sponges, is mesodermal, and can therefore not be directly compared to the analogous structures in higher Cœlenterates, but as we find the embryonic lamellæ so very indifferent in these low animals no great value can be attached to this difference. It is, however a further illustration of the peculiarity of sponges first pointed out by Marshall (1) that all their organs are mesodermal, that even the nervous system which throughout the animal kingdom is ectodermal or entodermal (Hydroid polyps, Actinia), is constituted of mesodermal cells in sponges.

There can be little doubt that there is a connection between the muscular cells of the membrane and the ganglia cells, although I have not been able to ascertain what this connection may be.

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(1) *W. Marshall.* Die Ontogenie von Reniera filigrana, O. Schmidt. Zeitschrift für wissenschaftliche Zoologie. Band XXXVII., Seit 497.

The nervous elements of sponges have been developed from neuro-muscle cells or also from indifferent mesodermal cells, the former is rendered more probable by their distribution.

The elements of sponges are derived from the different embryonic layers as follows :—

ECTODERM :

Flat Epithel cells.

ENTODERM :

Flat Epithel cells.
Collar cells.

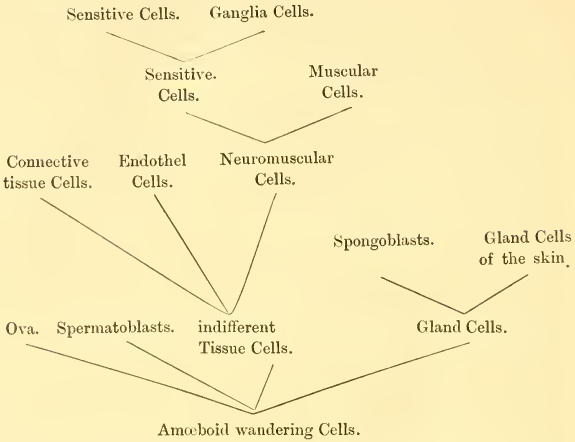
MESODERM :

Tissue cells.
Flat Endothel cells.
Ova.
Spermatoblasts.
Amœboid wandering cells.
Spongoblasts.
Gland cells of the skin.
Muscle cells.
Ganglia cells.
Sensitive cells.

The developement of the different Mesodermal cells may have been the following :

1. The *amœboid wandering cells* have retained the appearance and mode of life of those cells which originally grew inward from the outer coating of the Blastula to form the mesoderm.
2. From these the *ova*, *spermatoblasts* and *indifferent tissue cells* have been derived ; also the *Spongoblasts* and *gland cells of the skin* have descended directly from them.
3. From the *indifferent tissue cells* neuro-muscular elements were developed, which again further differentiated to form the *ganglia* and *sensitive cells* on the one hand, and the true *muscular cells* on the other ; also the connective ordinary *tissue cells* are derived from them.

This is made clear by the following table :—



Geographical Distribution.

I. Euspongia canaliculata dura.

West Coast of Australia, (Baily) ; East Coast of Australia, Port Jackson, (Von Lendenfeld.)

II. Euspongia canaliculata elastica.

South Coast of Australia, Port Phillip, (Von Lendenfeld.)

III. Euspongia canaliculata mollissima.

East Coast of Australia, Port Jackson, (Ramsay.)

Bathymetrical Distribution.

I. Euspongia canaliculata dura.

Shallow water ? Western Australia. 20 metres Port Jackson.

II. Euspongia canaliculata elastica.

10 metres.

III. Euspongia canaliculata mollissima.

15 metres.

71. SPECIES. EUSPONGIA SEPTOSA. Ridley.

EUSPONGIA SEPTOSA. Ridley (1).

SPONGIA SEPTOSA. Lamarck (2).

Shape and Size.

Euspongia septosa is attached to two or more stones over which, it forms horizontally expanded laminæ which rise into sub-cylindrical lobes 5 to 7 mm., in diameter.

Colour.

The surface has a dark grey colour, in spirits ; the interior dull pale brown, subtransparent. Skeleton fibres amber yellow, usually homogenous in appearance throughout.

Surface.

The surface is broken up by a number of sharp prominent ridges and points 1 to 3 mm., high ; the intermediate surface is rough. It has somewhat the appearance of a honey comb.

Canal System ?

Skeleton.

Main fibres set approximately at right angles to surface, thickness about 0·6 mm. ; primarie connecting fibres approximately vertical to main fibres, about ·035 to ·053 mm., in thickness, forming with some secundarie connecting fibres rounded-angled meshes, 0·14 to 0·21 mm., in diameter, between the main fibres which are about

(1) *Stuart O. Ridley.* Spongiida. Report on the Zoological Collection made in the Indo-Pacific Ocean, during the Voyage of H.M.S. Alert, 1881-2. British Museum of Natural History, Catalogue 1884, p. 381.

(2) *de Lamarck.* Sur les Polipiers empâtés. Annales des Museum. Tom. 20, p. 373, 1813.

0·42 mm., apart. Main fibres cored to some little distance from surface by a usually single series of small foreign bodies; connecting fibres uncored.

Rigidity.

Texture of sponge in spirit very tough and elastic.

Geograhpical Distribution.

North Coast of Australia, Torres Straits, Alert Island; (Alert.)

Bathymetrical Distribution.

15 metres.

III. SUB-GENUS. LAXIFIBRIS.

The skeleton of this sub-genus is very remarkable and shows, as indicated above, a further developement of the skeleton of *Euspongia canaliculata dura.*

The main fibres resemble those of Hircinia in as much as they are formed of a trellis work of densely interwoven fibres. The longitudinal ones are thicker than the transverse ones and one or two are particularly well developed and contain foreign bodies.

The connecting fibres are differentiated into primary and secundary fibres.

The primaries are not ramified, long smooth and gracefully curved. They are never bent at the joining points.

The secundaries are very short and thin, always simple and straight, and connect the primaries, both are free from foreign bodies.

72. SPECIES. EUSPONGIA MATHEWSI. Von Lendenfeld.

COSCINODERMA LANUGINOSUM. Carter (1).

COSCINODERMA LANUGINOSUM. Carter (2).

In the discussion of the varieties of *Euspongia conaliculata* I have given the reason for not considering peculiarities in the

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(1) *H. J. Carter.* Contribution to our Knowledge of the Spongida. Annales and Magazine of Natural History. 5th Series, Vol. XII., No. 71, p. 309.

(2) *H. J. Carter.* Descriptions of Sponges from the neighbourhood of Port Phillip Heads, South Australia. Annales and Magazine of Natural History, 5th Series, Vol. XV., No. 88, p. 318.

ramification of the connecting fibres of sufficient value to base genera thereon. For those reasons and also because the chagrin like surface is found in other species I do not consider the genus Coscinoderma Carter (1) as necessary and I place his and also some species which Poléjaeff (2) assigned to this genus in the genus Euspongia.

I have examined a dry sponge kindly forwarded to me by Mr. Mathew, R.N., which I named after him as above. Only afterwards I ascertained that this species is probable identical with Carter's species above mentioned.

The description of the soft parts is taken from Carter l.c., that of the skeleton is original. The notes given me by Mr. Mathew corroborate Carter's description.

This sponge is excellently adapted for bathing purposes and used for that purpose in the Caroline Islands.

Shape and Size.

Stipitate, expanding from a round stem in the form of a battle dore-shaped or triangular lamella, with conical processes on the upper margin. It measures 210 mm., in width and height and 40 mm., in thickness (Carter's largest specimen). Larger specimens were seen by Mr. Mathew.

Surface.

Surface for the most part even throughout, interrupted only by a small proliferous projection or out-growth on one side and a line of vents situated pandean pipe like along the upper border, between which the structure is denticulated. Pore sieves in the interstices of the cribriform incrustation which forms a reticulate chagrin like structure in consequence of the abundance of sand grains etc., in this net-work. The meshes of this net-work are 0·52 mm., wide. The lines a little wider.

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(1) *H. J. Carter.* Contributions to our Knowledge of the Spongida. Annales and Magazine of Natural History. 5th Series, Vol. XII., No. 17, p. 309.

(2) *N. Poléjaeff.* The Voyage of H.M.S. Challenger. Part XXXI. Report on the Keratosa, p. 50 ff.

Colour.

When fresh, grey, the same in spirits, but faint yellow internally. The beachworm skeletons are light grey.

Canal System.

Carter mentions sub-dermal cavities and vents on the margin. I am not able to judge from his description, but I would not think it unlikely that the vents are not vents at all but inhalent pseudoscula, similar to those described above of *Euspongia irregularis* and *Euspongia canaliculata.* A re-examination of the specimens will be necessary to decide this.

Skeleton. (Plate XXXVI., fig. 6.)

Carter says that "the wool-like character of the fibre, owing to its being so small and uniform *is* peculiar." That Carter put this "is" in italics firstly led me to believe that the sponges under consideration are identical. I have certainly never seen any sponge skeleton similar to the skeleton of this species in this respect.

The main fibres, as mentioned above in the diagnosis of the sub-genus, consist of a trellice work of fibres, and form a very dense network with small irregular meshes. In other words a perforated column. In this structure continuous thick fibres can be traced for short distances which are cored with foreign bodies, chiefly very fine grained sand. The whole structure measures 0·10 mm. in thickness. The fibres which form it, are 0·01-0·09 mm. thick and the meshes average a width of 0·08 mm.

These very peculiar main fibres were not seen by Carter, but as they are far apart and difficult to find I do not attach much importance to that.

These main fibres ramify irregularly, and it appears that occasionally, particularly at the joining points, the trellice work of which they consist becomes more loose and irregular, and in such localities there are no main fibres accordingly.

The primary connecting fibres are very long. I have traced some to a length of 5 mm. They extend from one main fibre to the other, they are vertical to the main fibres. The reason why they are so long, is because they do not connect the adjacent main fibres, but they extend often between two fibres far apart from each other. The consequence is that they cross each other in every direction. The most approximate points of any two crossing fibres are joined by a short secundary fibre which is straight, and very thin. These secundaries are all of uniform length, namely, 0·05 mm. Their thickness is 0·0058 mm. and also very uniform. All the primary connecting fibres are of the same thickness, namely, 0·018 mm.

It will appear from the above that the ramification is a most complicated and unusual one. Teased out specimens and also sections are very puzzling, and it is only by means of making sections in three directions at right angles to each other, that I was able to attain a clear insight into the structure of the skeleton of *Euspongia Mathewsi.*

Nothing is known of the Histology of this species.

Geographical Distribution.

South Coast of Australia, Fremantle (Carter); Port Phillip (Carter); tropical part of Pacific Ocean, Caroline Islands; Ponape (G. T. Mathew).

Bathymetrical Distribution.

42 Metres. Port Phillip.

IV. SUB-GENUS. DITELA.

The interior portion of the skeleton consists of radial main fibres, primary tangental and secundary, radial connecting fibres. This part of the skeleton is very similar to the skeleton of *Euspongia canaliculata dura.* The primaries are always simply curved or straight. They are never bent at the joining points. The secundaries are always quite simple and vertical to the primaries.

In the surface there is a very dense and irregular network which does not resemble the network of the interior at all. This is similar to the skeleton of *Euspongia officinalis* and to the interior of the skeleton of the species of the genus Densalis.

73. SPECIES. EUSPONGIA REPENS. Von Lendenfeld.

DITELA REPENS. Selenka. (1)

Selenka did not describe this species very minutely, but his excellent figure makes it sufficiently certain that the sponge to be described below, and Selenka's Ditela repens are identical.

SHAPE AND SIZE.

In outer appearance this sponge, particularly the skeleton of it, resembles some forms of chalinid sponges very closely, and it forms also in other respects a transition form between my subfamilies Sponginæ and Chalinospinæ. It is digitate, creeping and irregular. The digitate parts coalesce occasionally to form a lamellose extension, usually however they only grow together in a few places where they touch, They attain a length of 100 mm., are cylindrical, terminally rounded, and from 12-20 mm. in diameter. There thickness is generally very uniform throughout. My specimens are more regular than the one depicted by Selenka.

SURFACE.

The surface of the skeleton, and also of the animal, is slightly conulated. The conuli are small and low, on an average, 1 mm. apart and 0·4 mm. high. They are disposed very regularly. No sand is found in the skin, which is strongly protected by the dense Ditela network of fibres in it.

The oscula measure from 2-4 mm., are circular and occasionally very slightly raised over the surface. They are situated terminally, but also occur on the surface, particularly of large and irregular digitate pieces in great numbers.

(1) *E. Selenka.* Ueber einige neue Schwämmme aus der Südsee. Zeit schrift für wissenschaftliche Zoologie. Band 17, Heft 4, 1867, p. 567.

Rigidity.

The skeletons of these sponges are very tender and soft, and can be pressed between the leaves of a book like a flower.

COLOUR.

In spirits yellow, The skeleton has a brownish hue.

Canal System.

Selenka had only dry specimens, and I only saw some half decayed ones picked up on the beach, so that I cannot give any reliable account of the configuration of the canal system.

Skeleton. (Plate 36, fig. 5.)

The skeleton is very regular. It consists of main fibres which extend in a longitudinal direction along the Oscular tube which, in the shape of a hollow cylinder, takes up the centre of the digitate processes. From time to time, these fibres emit branches, which gracefully curve towards the surface, spreading like a fountain, and terminating in the superficial skeleton.

These main fibres are on an average 1 mm. apart and measure 0·04 mm. in thickness. They are filled with large sand-grains averaging 0·008 mm., which are so abundant as to cause the surface of the fibre to become very rough. The knobs are large and high.

In the interior of the sponge a very regular net-work of connecting fibres is met with. These are differentiated into primaries and secundaries. The former are simple, straight or slightly curved, very rarely branched, and never bent at their joining points with the secundaries. They are vertical to the main fibres, and connect the approximate fibres.

They are always free from foreign bodies and measure 0·015 mm. in thickness. They are particularly far apart. The interval averages 0·2 mm.

These primaries are connected by the secundaries. The latter are always straight, unbranched and simple, and generally more or less vertical to tke primaries. Their thickness varies from 0·0033 to 0·01 mm. They are, like the primaries not at all numerous, so that the whole network in the interior attains such wide meshes that I would not place this sponge in the genus Euspongia at all, where it not for the very dense network of connecting fibres which forms a thick superficial layer.

This latter is totally different from the network in the interior. It is formed of an ordinary dense uniform and irregular network, and forms a layer nearly 0·5 mm. thick on the surface.

The fibres which form this network possess an average thickness of 0·017 mm. (0·01-0·015 mm. Selenka l.c.), and the meshes of it are 0·05 mm. wide and rather irregular.

O. Schmidt (1) established his genus Ditela for a sponge with such a special superficial skeleton, he afterwards (2) however, united Ditela again with Spongia. It belongs doubtlessly to Euspongia (3.) The sub-genus of this name which I have established above for this species is not identical with O. Schmidt's (l. c. I.), original genus Ditela, as the interior skeleton of the two differ, but I have adopted it for the sake ot simplicity, as a name with which we are familiar, and of which we know that it means a sponge with a special superficial skeleton.

Nothing is known of the histology of this sponge.

Geographical Distribution.

South Coast of Australia, Port Phillip, (F. Mueller, Selenka, Von Lendenfeld.)

Bathymetrical Distribution.

Shallow water?

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(1) *O. Schmidt.* Die Spongien des Adriatischen Meeres, 1862. Seite 24.

(2) *O. Schmidt.* Supplement der Spongien des Adriatischen Meeres, enthaltend, Die Histiologie und Systematische Ergänzungen, 1864. Seite 27.

(3) *F. E. Schulze.* Untersuchungen über den Bau und die Entwicklung der Spongien. Siebente Mittheilung. Die Familie der Spongidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXXII., Seite 620.

V. SUB-GENUS. REGULARIS

The connecting fibres are of similar thickness in one and the same portion of the sponge, and the differences in their diameter is never so great as in the foregoing species. The variations do not as a rule exceed 10% of the average measurement.

The meshes of the network formed by these fibres are also accordingly much more regular. They are small and the connecting fibres are very thin as compared to those of the species in other sub-genera.

73. SPECIES. EUSPONGAI COMPACTA. Carter.

EUSPONGIA COMPACTA. Carter (1).

Shape and Size.

Thin, horizontal or vertical, extending concentrically from a pedunculated or contracted irregular base, terminating at the circumference in an irregularly fissured round margin. Consistence that of very compact felt. Size, about 11 by 6 mm., in its longest diameter, and 2 mm., thick.

Colour.

Dark fawn when fresh, light fawn or grey after exposure when dry; dermal tissue colcrless.

Surface.

Surface uniformly plain on both sides, interrupted only by the pedunculated attachment; minutely reticulated in relief from the subsidence of the dermal tissue upon the subjacent fibrous structure, which terminates in little conuli, each of which bears a sand thread, osculi numerous, small, circular, each provided with an annular diaphragm; disposed singly or in scattered groups on one side, more plentiful and more or less in juxtaposition on the other;

(1) *H. J. Carter.* New Sponges, Observations on old ones, and a proposed new Group. Annals and Magazine of Natural History. 5th Series, Vol. X., No. 56, p. 106, 1882.

when single and isolated, presenting a stelliform arrangement of the superficial branches of the exhalent canal system, but when on the margin, running in straight lines towards the latter. Pores in the interstices of a soft fibrous reticulation *in* the dermal tissue which tympanizes the interstices of the subdermal fibrous reticulation.

Canal System ?

Skeleton.

Internal structure composed of fine keratine fibre. densely reticulated; traversed plentifully by the branches of the exhalent canal system.

Geographical Distribution.

East Coast of Australia, (T. Jukes.)

Bathymetrical Distribution ?

73. SPECIES. EUSPONGIA OFFICINALIS. F. E. Schulze.

Ditela nitens. O. Schmidt. (1)
Euspongia officinalis. Graeffe. (2)
Euspongia officinalis. Poléjaeff. (3)
Euspongia officinalis. Ridley. (4)
Euspongia officinalis. F. E. Schulze. (5)
Feiner Badeschwamm, Eckhel. (6)

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(1) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Leipzig, 1862. Seite 24.

(2) *E. Graeffe.* Uebersicht der Seethierfauna des Golfes von Triest nebst Notizen über Vorkommen, Lebensweise, Erscheinungs und Fortpflanzungszeit der einzelnen Artcn. Arbeiten aus dem zoologischen Institute der Universität Wien und der zoologischen Station in Triest. Bd. 7, Heft 2, 1882, p. 3.

(3) *N. Poléjaeff.* Report on the Keratosa. Report on the scientific results of the voyage of H.M.S. Challenger, during the years 1873-76. Zoology, Vol XI., part 31, 1885, p. 53.

(4) *Stuart O. Ridley.* Spongiida. Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. Alert, 1881-2. British Museum of Natural History Catalogue, 1884, p. 379.

(5) *F. E. Schulze.* Untersuchungen über den Bau und die Entwickelung der Spongien. Siebente Mittheilung. Die Familie der Spongidæ. Zeitschrift für wissenschaftliche Zoologie. Bd. 32, Heft 4, 1879, p. 616.

(6) *Eckhel.* Der Badeschwamm. Triest, 1877.

Spongia adriatica. O. Schmidt. (7)
Spongia adriatica. O. Schmidt. (8)
Spongia agaricina. Ehlers. (9)
Spongia agaricina. Esper. (10)
Spongia agaricina. Pallas. (11)
Spongia discus. Duchassaing et Michelotti. (12)
Spongia graminæ. Hyatt. (13)
Spongia lapidescens. Duchassaing et Michelotti. (14)
Spongia lignea. Hyatt. (15)
Spongia mollissima. O. Schmidt. (16)
Spongia nitens. O. Schmidt. (17)
Spongia officinalis. Bowerbank. (18)
Spongia officinalis. Carter. (19)

(7) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Leipzig, 1862, p. 20.

(8) *O. Schmidt.* Supplement der Spongien des Adriatischen Meeres, enthaltend die Histiologie und Systematische Ergänzungen. Leipzig, 1864, p. 24.

(9) *E. Ehlers.* Die Esperschen Spongien in der Zoologischen Sammlung der K. Universität Erlangen. Programm zum Eintritt in den Senat der Königlich Fridrich-Alexander Universität in Erlangen. Erlangen, 1870, p. 11.

(10) *E. T. C. Esper.* Die Pflanzenthiere. Theil II., p. 216, 1791-1830.

(11) *P. S. Pallas.* Elenchus zoophytorum. Hagæ Comit, 1766, 1768, p. 397.

(12) *P. Duchassaing de Foubressin et Giovanni Michelotti.* Spongiaires de la Mer Caraïbe. Memoire publié par la Société Hollandaise des Sciences á Harlem 1864, p. 37.

(13) *A. Hyatt.* Revision of the North American Porifera, with remarks upon foreign species. Part II. Memoirs of the Boston Society of Natural History, Vol. II., 1877, p. 46.

(14) *P. Duchassaing et Michelotti.* Spongiaires de la Mer Caraïbe. Memoire publié par Société Hollandaise des Sciences á Harlem 1864, p. 34.

(15) *A. Hyatt.* Revision of the North American Porifera, with remarks upon foreign species. Part II. Memoirs of the Boston Society of Natural History, Vol. II., 1877, p. 45.

(16) *O. Schmidt.* Die Spongien des Adriatischen Meeres Leipzig 1862, p. 23.

(17) *O. Schmidt.* Supplement der Spongien des Adriatischen Meeres, enthaltend die Histiologie und Systematische Ergänzungen. Leipzig, 1864, p. 27.

(18) *I. S. Bowerbank.* A Monograph of the British Spongiadæ, Vol. I., Roy. Society for 1864, p. 205.

(19) *H. J. Carter.* Some sponges from the West Indies and Acapulca in the Liverpool Free Museum, described with general and classificatory remarks. Annals and Magazine of Natural History. Series 5, Vol. IX., No. 52, p. 270, 1882.

Spongia officinalis. Ehlers. (20)
Spongia officinalis. Esper. (21)
Spongia officinalis. Hyatt. (22)
Spongia officinalis. Linné. (23)
Spongia officinalis. Pallas. (24)
Spongia quarnerensis. O. Schmidt. (25)
Spongia vermiculata. Duchassaing et Michelotti. (26)
Spongia virgultosa. O. Schmidt. (27)

Of the numerous varieties of this species, which are found in all parts of the world, two belong to the Australian fauna.

They are the following :—

I. EUSPONGIA OFFICINALIS DURA. V. Lendenfeld.
Identical with Spongia Lignea Dura. Hyatt (l.c.)

II. EUSPONGIA OFFICINALIS CAVERNOSA. Ridley.

Shape and Size.

It is a difficult thing to describe the shape of this species as it is so very variable.

Massive rounded, irregularly labose, lamellose. The different varieties differ also in their outer appearance.

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(20) *E. Ehlers.* Die Esperschen Spongien in der Zoologischen Sammlung der K. Universität Erlangen. Programm zum Eintritt in den Senat der Königlichen Fridrich-Alexander Universität in Erlangen, 1870, p. 12.
(21) *E. T. C. Esper.* Die Pflanzenthiere. Theil II., p. 218.
(22) *A. Hyatt.* Revision of the North American Porifera, with remarks upon foreign species. Part II. Memoirs of the Boston Society of Natural History, Vol. II., 1877, p. 41.
(23) *Linné.* Systema Naturæ.
(24) *P. S. Pallas.* Elenchus zoophytorum. Hagæ Comit, 1766, 1768, p. 87.
(25) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Leipzig, 1862, p. 22.
(26) *P. Duchassaing et Michelotti.* Spongiaires de la Mer Caraïbe. Mémoire publié par la Société Hollandaise des Sciences á Harlem, 1864, p. 35.
(27) *O. Schmidt.* Die Spongien der Küste von Algier, mit Nachträgen zu den Spongien des Adriatischen Meeres (drittes Supplement) Leipzig, 1868, p. 4.

EUSPONGIA OFFICINALIS CAVERNOSA,

is bulbous, turnip-shaped (described by Ridley (l.c.), from a single dry specimen), with several tubular processes on its upper surface, 10-35 mm long, and 8-10 mm. in their greatest diameter. These processes however are ragged in outline at their distal ends and evidently in life opened through their fringed aperture, now obscured from the falling together of the sides. Their sides are in some cases fenestrate. The body of the sponge is rudely globular, and is drawn up above into monticular elevations, which are terminated by the tubes just described; the base is somewhat flattened and has been attached at more points than one. The horizontal diameters are 45 and 55 mm. The vertical height to base of uppermost tube is 30 mm.

From this description which is copied verbatim from Ridley (l.c.), it appears that this variety is most similar to my species Euspongia conifera. I will leave it however to Mr. Ridley to decide this, whether they are identical or not.

EUSPONGIA OFFICINALIS DURA,

Spongia lignea levis. Hyatt (l.c.)

I have but one dry specimen and also Hyatt's description, which is not accompanied by an illustration, is very meagre. The shape of this variety is irregularly massive, horizontally expanded, with indications of irregular conic elevations on the sides and upper surface. My specimen measures 140 x 160 x 80 mm.

RIGIDITY.

Some of the varieties of this species are exceedingly soft and elastic, to this peculiarity of them their utility must be ascribed.

The variety *Euspongia officinalis dura,* is as the name implies very hard. By the pressure of 1 kilogramme the specimen of which the dimensions have been given above is compressed only 2 mm.

Colour.

The colour of the varieties hitherto examined in the live state, varies according to F. E. Schulze (l.c.), from bright straw-yellow to rust-red and dirty dark brown. The skeletons have the colour of "burnt siena".

Surface.

The surface differs according to variety and locality, conuli are always present and scattered pretty regularly over the surface. No conuli are found in close proximity to the oscula (indication of an askeletous part as in *Euspongia canaliculata,* described above). The conuli attain a height of 1 mm., and are of a similar thickness at the base. In the fields between them, there is a very dense network in the interstices of which the pore-sieves are found. The pores are not numerous. The oscula are never raised and scattered irregularly or else situated in lines. (Compare F. E. Schulze's exhaustive description and his excellent figures, l.c.)

There are very few foreign bodies in the skin.

Canal System.

The skin is pretty thick and there are very slender canals, which lead from the inhalent pores into the subdermal cavities. The latter consist of irregular cylindrical and tangental canals which are not very wide, and separated by broad masses of tissue (F. E. Schulze, l.c., Tafel XXXVI., fig. 2).

The final ramifications of the inhalent canal system are narrow and give off comparative wide special canals to the ciliated chambers (F. E. Schulze, l.c., Tafel XXXVI., fig. 12.)

The chambers open direct into the exhalents or are connected with them by short and narrow special canals hardly wider than those which lead from the inhalents to the chamber pores.

The exhalents join to form oscular tubes in the usual manner.

In the variety *Euspongia officinalis cavernosa,* there are according to Ridley (l.c.), very extensive lacunæ. These are connected with the apertures at the summits of the tubes. As Ridley's specimen was dry it is difficult to ascertain whether these cavities are vestibule-lacunæ or Oscular tubes. I am inclined to consider them as the former, judging from their similarity with the homologous structures in *Euspongia irregularis* and *canaliculata* described above.

Skeleton.

The main fibres are straight and not very thick, they contain a greater or smaller amount of foreign bodies.

The connecting fibres form a regular network, as mentioned in the description of the sub-genus.

The meshes are regular and small. The average thickness of the fibres is according to F. E. Schultze (l.c., p. 635), 0·03-0·038 mm. It varies according to the varieties.

I. Euspongia officinalis cavernosa.

The skeleton consists of (1), stouter main fibres, which are approximately straight and parallel to each other, about 0·04-0·07 mm. apart, more or less vertical to the surface (I presume this a mistake, it ought to be 0·4-0·7 mm.) according to position. Thickness about 0·03-0·04 mm., and (2) of connecting fibres, similar to the main fibres, and more or less vertical to them, but often very obliquely placed, thickness about 0·013-0·03 mm.; distance apart, very variable from 0·14 upwards.

II. Euspongia officinalis dura.

The main fibres are very thick and pretty close together, being on an average 0·5 mm., apart and measuring 0·2 mm., in thickness. The main fibres of no other variety are so thick. They are completely filled with foreign bodies 80% sand grains averaging 0·05 mm., and foreign spicules. These are mostly short fragments. The surface of the main fibres is uneven. The knobs are not high.

The connecting fibres form a very regular network. The meshes average 0·33 mm., in width. The thickness of the fibres is 0·033 mm.

The excessive hardness of this variety is due to the exceptional thickness of the main fibres.

Histology.

The histology of some of the Mediterranean varieties has been worked out in such a manner by F. E. Schulze (l.c.) that it would be necessary to translate them verbatim here. As however every one, who intends to study the sponges must *ipse facta* possess and read F. E. Schulze's works, it will suffice here simply to refer to the work of that author cited above.

Geographical Distribution.

Mediterranean, (compare particularly Eckhel's map); North Atlantic Ocean, (Eckhel, Hyatt and others); South Atlantic Ocean, (Ridley); North Pacific Ocean, (Carter and Hyatt); Indian Ocean, (Pallas).

In the Australian Seas.

I. Euspongia officinalis cavernosa.

North Coast of Australia, Torres Straits. (Alert.)

II. Euspongia officinalis dura.

West Coast of Australia (Bailey); South Coast of Australia, Port Phillip (Hyatt).

Bathymetrical Distribution.

20-200 metres. in the Mediterranean (Eckhel).

I. Euspongia officinalis cavernosa.

19 metres.

II. Euspongia officinalis dura.

Shallow water.

76. SPECIES. EUSPONGIA BAILYI. Nova species.

Shape and Size.

This sponge has the shape of a cup or goblet. This shape is very constant and characteristic. Sometimes there are two cups joined to each other. Generally, however, there is only a single one. The cup stands upright on the sea bottom to which it is attached by one or more points of the more or less expanded base. Sometimes the cup is high and narrow, twice as long as broad ; sometimes it is broad and horizontally expanded, barely as high as broad.

The cup attains a height of 170 mm. and a breadth of 190 mm. It is in the specimen 170 mm. high, 105 mm. deep. Generally about two-thirds of the height of the sponge in depth. The lamella forming the cup thins out towards the margin very rapidly so that the margin, which always is very regularly circular, appears quite sharp.

Surface.

The outer surface is very rough and uneven. There are high irregularly longitudinal ridges, and also other outgrowths of varying shape. The skeleton presents a great irregularity of the outer surface. The inner side of the cup is very smooth, and the skeleton possesses on that side numerous round holes, averaging 3 mm. in diameter, which probably indicate the position of the oscula.

As only dry skeletons are at my disposal, I am not able to give a detailed description.

Rigidity.

The sponge is pretty soft and elastic. By the pressure of 1 kilogramm on the side of the cup it is depressed (large specimen) about 10 mm. Small pieces of the cup wall, of the size of a cubic centimetre can be compressed by the weight of 1 kilogramm to a thickness of 1 mm.

Colour.

In the live state unknown. The colour of the beach worn specimens is light brown.

Canal System.

The structure of the skeleton indicates that there are skeletous and askeletous portions, in as much, as rounded grooves are found in great abundance between the ridges of the outer surface.

Skeleton.

The main fibres are straight, on an average 0·7 mm., apart and extend from the base upward and outward, terminating always in the tags on the outer surface of the cup.

They measure 0·1 mm., in thickness and are smooth. *They do not contain any foreign bodies*, and their surface is accordingly quite smooth.

The connecting fibres form a very regular network, the meshes of which average 0·25 mm. Their thickness is 0·04 mm.

Nothing is known of the histology of this sponge.

Geographical Distribution.

West Coast of Australia, (Baily.)

Bathymetrical Distribution.

Shallow water ?

77. SPECIES. EUSPONGIA LEVIS. Nova species.

Shape and Size.

Euspongia levis is a lamellar species and resembles in outer appearance, to a certain extent, forms of the genus Antheroplax.

From a central mass, which is attached by a small portion of the base, numerous lobate lamellæ arise, which are straight or slightly curved and generally possess a serrate margin. The serrations are often so marked, that digitate processes are formed on the free margins of the curved lamellæ. These processes may be flattened or cylindrical, but they never reach a large size. The lamellæ enclose each other to a certain extent, so that a flower shaped form is produced.

The largest specimens measure 80 mm. in width and 60 mm., in height. The lamellæ have a very uniform thickness of 8-10 mm. The digitate processes may attain a length of 75 mm.

Colour.

The sponge is, alive and in spirits, of a brownish grey colour.

Surface.

The surface is perfectly smooth. There are no conuli. With a magnifying glass a very regular network of sand grains can be detected similar to the one which is described in this paper of *Euspongia canaliculata.*

In the meshes of this network we find the pore-sieves, which are slightly depressed and perforated by numerous small pores.

The oscula are disposed in an irregular line on the free margin of the lamella. A few are also met with on the broad sides. They measure about 1 mm., across, are circular, and slightly elevated above the surrounding surface. The oscula are numerous.

Canal System.

Below the outer skin a reticulation of anastomosing tangental canals are met with, which represent the subdermal cavity. The pore-sieves with their numerous pores cover the sub-dermal cavities in the shape of a thick skin, which is pervaded by numerous narrow canals as in *Euspongia silicata.*

The skin has a thickness of 0·22 whilst the pores and canals possess an average width of 0·03 mm. The pores can apparently be entirely closed by the sponge, although some of them are always seen open.

The greatest number observed in one pore-sieve was 16.

These canals are not very large, they measure on an average 0·2 mm. in diameter and are oval or irregular in transverse section.

They are not very numerous, and there is only one single layer of them. The firm substance between them is about as voluminous as the canal space.

Towards the centre of the lamella large exhalent lacunose canals are met with, which unite to form an oscular tube, tending upward and terminating with the circular osculum on the lamella margin.

Between these two canal-systems smaller canals, averaging 0·05 mm. in diameter are met with, these have mostly a circular transverse section and extend in a longitudinal direction. Some of them are exhalents, others inhalents. Between them the ciliated chambers, which are spherical and represent about three-quarters of spheres, are met with. They measure 0·037 mm. in diameter.

SKELETON. (Plate 36, fig. 2.)

The skeleton resembles that of *Euspongia officinalis* pretty closely. The main fibres are slightly branched and disposed longitudinally. They are free from foreign bodies, and on an average 0·1 mm. thick.

The connecting fibres form a very regular network. No secundary and tertiary fibres as in *Euspongia canaliculata* can be distinguished. All the connecting fibres are free from foreign bodies and 0·016—0.032 mm. thick. The most connecting fibres measure about 0·025 mm.

The meshes of the connecting fibre network are on an average 0·1 mm. wide. They become smaller in the vicinity of the main fibres.

Here and there we find large sand grains measuring 0·2—0·4 mm. enclosed and embodied in the skeleton. These resemble the sand-grains forming an essential part of the skeleton of Aulena villosa, very closely. They are found occasionally in the network of the connecting fibres, but generally in the main fibres.

In the outer skin occasionally similar sand grains are met with, and there is no doubt that the sponge grows around these and so they become imbedded in it. Where the large sand grain has been attached near the termination of a main fibre it is simply taken up by it, this is the usual way in which the main fibres attain their core of foreign bodies. Between the main fibre terminations however, in the fields, we never find the foreign bodies in the surface being taken into the body of the sponge in other species of Euspongia. It appears that in this species the sponge selects from the numerous foreign bodies in its surface these large ones and allows them to be imbedded in its body, whereas all the other smaller ones present in abundance remain always in the outer skin.

Geographical Distribution.

East Coast of Australia, Port Jackson (von Lendenfeld, Ramsay); Broughton Island (Ramsay).

Bathymetrical Distribution.

5-10 metres (in Port Jackson).

The specimens from Broughton Island are larger than those from Port Jackson.

VI. SUB-GENUS. DENSALIS.

The species referrable to this genus are characterised by the small size of the meshes in the net-work formed by the connecting fibres, and the great thickness of them.

Whereas in the sub-genus Regularis the connecting fibres are about a tenth in thickness of the width of the meshes in the net-work, here they are only a sixth or less. The consequence of this is, that the skeleton becomes very dense.

78. SPECIES. EUSPONGIA PARVULA. Nova Species.

Shape and Size.

Euspongia parvula is a very small and inconspicuous sponge.

It consists of conic or tapering digitate processes which grow out from a lamellose base attached by one side, The largest specimen measures 50 mm., in height and 30 mm., in width; the digitate processes reach a length of 25 mm., and are at the base 8 mm., wide. They are not regularly circular in transverse section but laterally compressed. Their ends are pointed.

Surface.

The surface is conulated, the conuli attain a height of 1 mm., and are 3 mm., apart.

There is very little sand in the skin. The fields are subdivided by a net-work of ridges as usual into secundary fields which contain the pore-sieves.

Rigidity.

The skeleton is soft and not very elastic. The digitate processes can be compressed to a tenth of their thickness by the weight of 1 kilogramm.

Colour.

The colour of the live sponge is dark bluish grey. This colour is retained in spirits.

The canal system does not present any peculiarities. It is similar to that of *Euspongia officinals* in every respect.

Skeleton.

The straight main fibres measure 0·09 mm., in thickness. They are about 3 mm., apart. This is the reason why the sponge is so soft.

They are cored by sand grains which average 0·02 mm. The foreign bodies are scarce and scattered, the surface is smooth.

The connecting fibres measure 0·09 in thickness. They are as thick as the main fibres and the meshes average a width of 0·3 mm. They are rather irregular.

The specimens are not sufficiently preserved to enable me to give an account of the histology of this species.

Geographical Distribution.

Mauritius, (Von Haast.)

Bathymetrical Distribution.

Shallow water ?

79. SPECIES EUSPONGIA RETICULATA. Nova species.

Shape and Size.

This species presents a very irregular appearance. It consists of irregularly curved and continually anastomosing digitate, and lamellose portions, which combine to form a perfect network.

The whole structure attains a size of 250 mm. in length and 100 mm. in height and width (the largest specimen.) The lamellose and digitate portions have an average thickness of 15 mm., while the interstices between them average a width of 20 mm.

The apertures, by which these large cavities open on the outer surface of the whole structure are irregular, and generally a little narrower than the internal cavities.

Surface.

The surface of the exposed portions, the outer surface appears conulated. The surface of the caverns in the interior is smooth. As I only possess skeletons of this species, a detailed description cannot be given.

Rigidity.

The skeleton of this sponge is hard and elastic. A large specimen is compressed by the weight of 1 kilogramm only about 5 mm. Small pieces are hardly compressed at all by that weight. Even the weight of 80 kilogramm only compresses the skeleton to half its size.

Canal System.

The cavities in the interior can be considered as vestibule spaces, but it appears as if these were secundary vestibules as also in the lamellæ themselves, we find indications of lacunæ and wide canals, which are very similar to the vestibule cavities in *Euspongia irregularis tenuis,* described above.

No indication of the position of the Oscula can be found in the skeleton, and also askeletous portions do not appear to exist. There are no grooves in the skeleton.

The canal system proper, must be composed of very fine canals as the skeleton appears very dense.

Skeleton. (Plate XXXVI., fig. 4.)

The main fibres are continuous from the base, apparently to the extremities of the net structure of this sponge. This species in every respect presents many peculiarities, which stamp it to a transition form between the genera Euspongia and Hippospongia. Also the main fibre show in some places indications of a similarity with those of Hippospongia.

The main fibres are on an average 0·5 mm. apart, often however two or three extend for a long distance parallel and remain close together.

The fibres are completely filled with sand. The grains of this are small. The surface is roughened by numerous knobs, which often attain a height equal to half the diameter of the fibre.

The sand grains average 0·009 mm. The thickness of the main fibre is 0·038 at the thinnest, and 0·14 mm. at the thicker parts.

The connecting fibres form a network of meshes measuring on an overage 0·2 mm.. in width in the interior of the sponge. Here they are 0·05 mm., thick. The connecting fibres do not contain any foreign bodies.

On the surface another kind of network is met with. The meshes are narrower and the fibres thinner, and the whole structure is more irregular. This surface skeleton is however by no means always present and may be a pathological structure, caused locally to make its appearance where cammensols have taken up their abode.

Nothing is known of the histology of this species.

Geographical Distribution.

East Coast of Australia. Port Jackson, (Ramsay.)

Bathymetrical Distribution.

30-40 metres.

VII. SUB-GENUS. SILICIFIBRIS.

The skeleton of the species belonging to this sub-genus is similar in shape to that of the Regularis species. The main fibres are perforated where they are, as it is generally the case, slightly flattened.

The connecting fibres are of uniform thickness and form a pretty regular network.

The peculiarity of the sponges belonging to this sub-genus is, that they have a very great proclivity for foreign siliceous spicules, which are not only found in great abundance in the main fibres but also in the connecting fibres.

It will be remembered that in none of the other sub-genera, foreign bodies are found in the connecting fibres.

80. SPECIES. EUSPONGIA GALEA.

Nova Species.

Shape and Size.

This species presents the shape of a graceful cup. It is 250 mm. high and measures at the top 260 mm. in diameter. The margin of the cup is regularly circular. The cup is nearly cylindrical the base being nearly as broad as the top. It is perforated at the bottom. Also the sides are perforated here and there. The wall of the cup measures 100 mm. in thickness at the thickest part and becomes thinner towards the margin, which is sharp.

Surface.

The outer surface is rendered very uneven and irregular by the appearance of numerous longitudinal irregular and round ribs which extend over it. Only a skeleton is at my disposal. The inner side of the cup is not near so uneven as the outer. The skeleton indicates that there were askeletous portions, by the presence of smooth grooves.

Canal System.

The whole structure is excessively lacunose and light. The wall of the cup is pervaded in every direction by wide and anastomosing lacunæ, which indicate that this species possesses very highly developed vestibule cavities. No trace of oscula is visible.

Skeleton.

The main fibres are straight, and here and there flattened and perforated. They measure 0·07 mm. in thickness and are 1 mm. apart. Their surface is rough and even slightly spiny. They are cored with longitudinally disposed foreign siliceous spicules. 0·1 mm. on an average in length.

The connecting fibres form a net-work, the meshes of which average 0·2 mm. in width, the thickness of the connecting fibres is 0·06 mm. on an average. The connecting fibres only contain very few foreign spicules, much fewer than the connecting fibres of *Euspongia silicata*.

Geographical Distribution.

East Coast of Australia. (Ramsay.)

Bathymetrical Distribution.

Shallow water?

79. SPECIES EUSPONGIA FOLIACEA. Ridley.

EUSPONGIA FOLIACEA. Ridley (1).
? SPONGIA FOLIACEA. Esper (2).
? PLATYCHALINA FOLIACEA. Ehlers (3).

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(1) *Stuart O. Ridley*. Spongida. Report on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. Alert, 1881-2. British Museum of Natural History, Catalogue 1884, p. 378.

(2) *E. T. C. Esper*. Die Pflanzenthiere. Theil I. Seite 201, 1791.

(3) *E. Ehlers*. Die Esperschen Spongien in der Zoologischen Sammlung der K. Universität Erlangen Programm zum Eintritt in den Senat der Königlich Fridrich-Alexander Universität in Erlangen. Erlangen 1870. Seite 21.

Shape and Size.

Euspongia foliacea is a ceratose species, differing from the common species of Euspongia, only in its flattened form. There are numerous small pores scattered all over one side (the front) of the sponge. Size ?

Colour ?

Surface.

On the surface there are conic elevations. With the exception of a few fragments of spicules of different thickness, found singly and rarely in a few fibres, more numerous in the surface, there are no spicules at all. They seem to be foreign bodies taken in, in small quantities into the surface-tuft.

Canal System ?

Skeleton.

The fibres of the main skeleton agree in their consistency and non-rectangular arrangement with those of Euspongia, and as stated already, foreign bodies are the exception even in the surface tufts. The diameter of the fibres is ·4 to ·7 mm., except in delicate Ditela network of the surface and interstices, where it is only ·0085 to ·022 mm.

This description is hardly sufficient.

Geographical Distribution.

North Coast of Australia ; Torres' Straits, West Island ; (Alert.)

Bathymetrical Distribution ?

82. SPECIES. EUSPONGIA SILICATA. Nova Species.

Shape and Size.

The specimens which I refer to this species are small, horizontally extended, lobed and vertically compressed. The largest specimen attains a size of 70 mm. in length, 40 mm.in breadth and 20 mm. in height. The thickness of the lamellose sponge rarely exceeds 14 mm.

Surface.

The surface of the sponge is perfectly smooth in the living state. There are, however, in hardened specimens, which always shrink a little ; slight depressions in the fields between the terminations of the main fibres in the skin, which then, of course, appear as conuli. (Plate XXXVIII., fig. 1).

A few tangental connecting fibres radiate from the terminations of the main fibres and these support the skin in which they extend, they are not different from the fibres in the interior. There are only very few foreign bodies in the skin, so that the slightly raised ridges on the surface, which form the usual network dividing the pore-sieves from each other, do not appear like dense masses of sand, as in some of the species described above. The few foreign bodies are scattered irregularly over the surface, they are always tangentally disposed, foreign siliceous spicules often quite unbroken. (Plate XXXVIII., fig. 1.) In the pore-sieves there are a great many small pores. (Plate XXXVIII., fig. 3).

The oscula are small and numerous, scattered irregularly over the surface or also grouped in lines. They are circular and measure 1 mm. in diameter. They appear very slightly raised over the surface.

Rigidity.

This sponge is very hard and elastic. A lamella, 10 mm. in thickness and 400 □ mm. large is compressed, 3 mm. by the weight of one kilogramm.

Colour.

In the living state this species is of a greyish rose colour. In spirits it appears darker grey on the surface and lighter grey in the interior. The dry skeleton is light brown.

Canal System.

From the pores in the pore-sieve mentioned above, which measure, when dilated, 0·01 mm. in diameter, and which are circular, cylindrical canals lead down to the sub-dermal cavities. (Plate XXXVIII., fig. 2 *c*). There always are a great number of pores, as many as 30 in one pore-sieve. The canals which lead down from them extend tangentally and obliquely, and join to form larger canals which likewise extend tangentally. (Plate XXXVIII., fig. 1). These finally open into the sub-dermal cavity, which is formed by large tangental irregular canals, separated from the outer surface by a very thick skin 0·15 mm. in thickness. (Plate XXXVIII., fig. 2).

This part of the canal system is very similar to corresponding parts of the canal system in certain Gumminæ (1).

The sub-dermal cavities measure 0·14 mm., on an average in width, although there are here and there spaces 0·6 mm., wide.

From this net work of tangental canals which forms the sub-dermal cavity, canals extend obliquely downward which rapidly ramify in an irregular manner. These branches supply the sponge. Their size of course is very variable but they rarely exceed 0·2 mm., in diameter and mostly have a circular transverse section.

The ciliated chambers are attached to the final ramifications of these canals without the formation of any special canals leading to the chamber pores as in *Euspongia officinalis.* The chamber pores are also much smaller and apparently more numerous.

The small exhalents join to form large canals which are irregular and may attain a width of 0·7-0·9 mm. These join and form the oscular tubes which are generally vertical to the surface and straight, with a circular transverse section. They are about 1·2 mm. wide, and extend nearly right through the lamellose sponge. Into the sides and particularly into the lower portion of this oscular tube, these exhalent canals open.

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(1) *F. E. Schulze.* Untersuchungen über den Bau und die Entwicklung der Spongien. Dritte Mittheilung. Die Familie der Chondrosidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXIX., Seite 87.

As mentioned above, the osculum is about 1 mm wide, so that the tube appears contracted towards tbe osculum.

SKELETON. (Plate XXXVIII., fig. 1.)

The skeleton consists of compressed main fibres and a very regular net work of connecting fibres of uniform diameter.

The main fibres are often expanded so as to appear flat, and then the margins of the flattened expansions are perforated by oval holes and in this way there is no abrupt distinction between main and connecting fibres as they are connected by this intermediate structure.

The thickness of the main fibres where it is not expanded, is 0·066 mm. The main fibres are on an average 0·6 mm. apart, and extend from the points of attachment of the sponge upwards and outwards. They are disposed in a radiating manner round these points to a certain extent.

They are however very irregular, and much bent and curved in various ways.

They are cored with foreign siliceous spicules averaging a length of 0·07-0·09 mm. These spicules are always broken, and it appears taken into the fibre without any discrimination. They protrude to a certain extent beyond the surface of the fibre, causing it to appear rough, or even spiny. The spicules are disposed mostly in a longitudinal direction occasionally very oblique however. Then one of their ends protrudes. This end is generally the more pointed one of the two. Some of the spines thus disposed point outward, towards the surface, others again inward towards the centre of the sponge. The spicules are also, where they protrude entirely enclosed by a sheath of horny substance. (Plate XXXVIII., fig. 1).

The connecting fibres form a regular net-work. The meshes average a diameter of 0·09 mm.

The thickness of the connecting fibres is 0·025 mm.

The connecting fibres contain in their axes similar foreign siliceous spicules as the main fibres (Plate XXXVIII., fig. 2) these are always disposed longitudinally.

Histology.

The study of some well preserved specimens of this sponge has led to some interesting discoveries, which show that this species possesses some peculiarities in its structure hitherto not observed in other sponges.

Gland Cells.

In the skin between the canals, which lead down from the pores, amœboid cells are found, which present the usual shape, but appear more granular. Others again with a still more granular protoplasme are found attached to the ectoderm cells covering the outer surface and the inhalent canals.

There are all desirable transition forms from these amœboid wandering cells to true gland cells (Plate XXXVIII., fig. 2 *a*) attached by their thin end to the ectodermal epithelia. These are club-shaped and resemble those gland cells described by Méréjowsky (1) of Halisarca very closely. They differ from those described by me of Aplysillidæ (2) only in so far as they possess only a single process to connect them with the surface.

No nucleus is visible in these cells, which are completely filled with granules when fully developed.

The remarkable thing is, that these cells are found not only on the outer surface but all along the narrow inhalent canals.

It makes one the impression that some of the amæboid wandering cells are converted into these gland cells, wherever these gland cells may be required. The whole of the protoplasm of the amœboid cells seems to be converted into the slimy secretion, the granules.

It is further of interest to note that these gland cells are expelled from the sponge *in toto*, and that they then spread out on the outer surface where apparently they are converted into slime.

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(1) *C. Méréjkowsky.* Etudes sur les Esponges de la Mer Blanche. Mémoires de l'Académie Imperiale des Sciences de St. Pétersbourg, VII. Serie, No. 7.

(2) *R. von Lendenfeld.* Ueber Cœlenteraten der Südsee. II. Mittheilung. Neue Aplysinidæ. Zeitschrift für wissenschaftliche Zoologie. Band XXXVIII., Seite 268.

I have sections where the whole mass of granules representing one gland cells can be seen on their way out from the mesoderm, through the Ectodermal Epithelium. In other sections again the masses of granules are seen on the outer surface.

These cells accordingly secret the slime by being converted into it, like some of the cells in the milk glands of mammals. At the same time this accounts for my observation made some years ago (1) that the gland cells disappear after they have secreted slime for some time. They are regenerated as long as there are any amœboid wandering cells, but when there are no more of these the production of slime must cease.

It appears that these gland cells are being formed as an emergency occurs, and need not necessarily always be present. It would otherwise be surprising that F. E. Schulze and others did not see them.

Sensitive Cells.

In the skin there are some isolated spindle-shaped cells, which I am inclined to consider as nervous elements. (Plate 38, fig. 2 *d.*) They are very slender and taper downward to a fine granular thread which can be traced for some distance. Remnants of a Palpocil. (Plate 38, fig 2 *e*), were observed several times.

Ganglia cells do not appear to be present.

Geographical Distribution.

East Coast of Australia, Port Jackson (Ramsay, von Lendenfeld); North Coast of Australia, Torres Straits, (Macleay); Northern Territory of South Australia, (Haacke.)

Bathymetrical Distribution.

40 metres, Port Jackson ; shallow water ?

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(1) *R. von Lendenfeld.* L.c.

EXPLANATION OF PLATES.

NOTE.—In all cases where no mention is made in the explanation of the method in which the plates were drawn, Zeiss's new reflecting camera has been employed, so that the relative dimensions are very reliable.

PLATE 36.

Fig. 1.—*Euspongia canaliculata.* R. v. L. Var. *dura.*
Skeleton.
Distal part of a transverse section through the massive part of the sponge.
50:1 magnified.

Fig. 2.—*Euspongia levis.* R. v. L.
Skeleton.
Transverse section through the outer surface.
50:1 magnified.
Showing sand-grains in the skin (*a*), and large solitary sand-grains in the network of the clear horny threads (*b*), (*c*) are the spaces for the sub-dermal cavities.

Fig. 3.—*Euspongia irregularis.* R. v. L. Var. *Jacksonia.*
Skeleton.
Portion of the network formed by the connecting fibres.
50:1 magnified.

Fig. 4—*Euspongia reticulata.* R. v. L.
Skeleton.
Portion of the network formed by the connecting fibres.
50:1 magnified.

Fig. 5.—*Euspongia repens.* R. v. L.
Skeleton.
Portion of the network
Transverse section through the outer surface.
50:1 magnified.

Fig. 6.—*Euspongia Matthewsi.* R. v. L.
Skeleton.
Portion of the network.
50:1 magnified.

PLATE 37.

Fig 1.—*Euspongia canaliculata.* R. v. L. Var. *elastica.*

Transverse section through the outer portion of one of the digitate processes.

Combined picture.

450:1 magnified.

(*P*) Pore-sieve. (*p*) Inhalent pores. (*a*) Askeletous portion of the sponge. (*s*) Skeletous portion of the sponge. (*M*) Radiating main fibre charged with sand, etc. (*S*) External sand armour in the outer skin in direct connection with the sandy core of the main fibre. (*V*) Connecting fibres free from foreign bodies. (*b*) Sharp pointed ends of the connecting fibres at the limit of the skeletous portion of the sponge. (*c*) Axial thread in the connecting fibres. (*O*) Groups of ova. (*E*) Endothel cell-capsules, including the ova-groups. (*d*) Sub-dermal cavities belonging to the inhalent system. (*e*) Inhalent canals. (*f*) Exhalent canals. (*L*) Lacunæ of the exhalent system in the askeletous portion of the sponge. (*G*) Ciliated chambers. (*h*) Muscular membrane dividing the skeletous from the askeletous portion of the sponge, consisting of highly granular spindle-shaped cells. (*i*) Ganglion on the distal end of the muscular membrane. (*k*) Tangental nerves issued from the ganglion. (*l*) Sensitive cells in connection with the ganglion.

PLATE 38.

Fig. 1.—*Euspongia silicata.* R. v. L.

Transverse section through the outer portion of the sponge.

Alcohol, Alum-carmin.

100:1 magnified.

(*a*) Primary inhalent canals. (*b*) Sub-dermal cavities. (*c*) Conuli. (*m*) Main fibres.

Fig. 2.—*Euspongia silicata.* R. v. L.

Transverse section through the outer skin.

Alocohol Alum-carmin.

1000:1 magnified.

(*a*) gland cells. (*b*) Inhalent pores. (*c*) Narrow, primary, inhalent canals leading from the pores into the sub-dermal cavity. (*d*) Sensitive cells. (The hypothetical palpocils (*e*) are not visible in the sections.) (*f*) Flat ectodermal cells. (*g*) Muscular and connective cells, spindle-shaped or multiplolar. (*h*) Amœboid wandering cells.

Fig. 3.—*Euspongia silicata.* R. v. L.
Portion of the skin seen from without.
Alcohol Alum-carmin.
135:1 magnified.
(*C*) Conuli. (*p*) Pores.

NOTES AND EXHIBITS.

Mr. Brazier exhibited a specimen of *Minyas*, n. sp., an Actinid of the N.W. Coast of Australia, from the Australian Museum.

The Rev. J. N. Manning exhibited a remarkably perfect fossil fish from the brick-yard of Mr. Abel Harver, St. Peter's, Cook's River. The rock in which this specimen is preserved is undoubtedly a portion of the Wianamatta Shales. It was regarded as a Ganoid by most members; but Mr. Ogilby maintained it to be of Cyprinoid affinities.

Mr. Macleay exhibited a male and female specimen of *Phalacrognathus Muelleri*, the insect described in his paper; also a male and female specimen of *Necrodes osculans*, an insect described by Vigors in 1825 as an inhabitant of India, but which has lately been found in Queensland and New Guinea. Mr. Macleay also exhibited a specimen of petrified wood from Mr. W. R. Campbell's Trigamon Station, Gwydir District, which appeared to be identical with the existing Myall tree.

Mr. Sidney Olliff exhibited some of the insects mentioned in his Paper—one a *Rhysodes*, a genus entirely new to Australia.

Dr. von Lendenfeld exhibited two photographs of Glacier-polished Rocks in the Mount Lofty Group, near Adelaide. They are Siluro-Devonian and show the striæ well. They are the same to which reference was made at a recent Meeting of the Society.

E. P. Ramsay, Curator of the Musuem, exhibited large specimnes of *Boltenia australis*, which had been secured through the kindness of Capt. Hixon, R.N. They were a portion of a mass of about a ton weight, found growing on the chain of a buoy placed off Dobroyde Point on the 9th of July 1884, and taken up on September 30, 1885. The largest specimen measured 3½ inches by 4 inches, the stalk 10½ inches in length, the color is of a rich orange red.

The Hon. James Norton, M.L.C., exhibited specimens of a Weeping Eucalyptus (Ironbark) with deep rose coloured flowers and branches of apparently the same species with white flowers—both varieties are from Canley Vale.

The President drew attention to the report upon Tasmanian Fisheries recently presented to Parliament by Mr. W. Saville-Kent, F.L.S., F.Z.S., in which it is stated that the true Salmon, *S. salar*, had not as yet been established in the island, that it is probable that none of the ova imported in 1864 arrived at maturity, and that the large fish which have been reputed to be Salmon are in reality Brown Trout (*Salmo fario*), "corresponding in all essential points with that variety known in England as the Great Lake Trout, or *Salmo fario*, var., *ferox* or *lacustris*."

Considerable discussion followed, in which much hesitation was expressed as to the absolute determination of the points here mentioned, Mr. Ogilby declaring that the *Salmo fario* and all its forms (*S. trutta*, *S. levenensis*, *S. ferox*, *S. gallivensis*, *&c.*), differ only in consequence of variation in diet, time of breeding, depth of water, &c.